Anritsu

MS8608A/MS8609A

Digital Mobile Radio Transmitter Tester

Operation Manual

Vol. 2

MP MASTER
MA34521

Read this manual before using the equipment.
Keep this manual with the equipment.

Anritsu

MS8608A/MS8609A

Digital Mobile Radio Transmitter Tester

Operation Manual

Vol. 2

(Spectrum Analyzer Function)

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Anritsu

MS8608A/MS8609A Operation Manual Vol. 2

MS8608A/MS8609A

Digital Mobile Radio Transmitter Tester

Operation Manual

Vol. 2

(Spectrum Analyzer Function)

Fourth Edition

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Measurement Solutions

ANRITSU CORPORATION

JUN.
2002

Document No.: M-W1744AE-4.0

Safety Symbols

To prevent the risk of personal injury or loss related to equipment malfunction, Anritsu Corporation uses the following safety symbols to indicate safety-related information. Insure that you clearly understand the meanings of the symbols BEFORE using the equipment.
Some or all of the following five symbols may not be used on all Anritsu equipment. In addition, there may be other labels attached to products which are not shown in the diagrams in this manual.

Symbols used in manual

DANGER ⚠ This indicates a very dangerous procedure that could result in serious injury or death if not performed properly.

WARNING ⚠ This indicates a hazardous procedure that could result in serious injury or death if not performed properly.

CAUTION ⚠ This indicates a hazardous procedure or danger that could result in light-to-severe injury, or loss related to equipment malfunction, if proper precautions are not taken.

Safety Symbols Used on Equipment and in Manual

The following safety symbols are used inside or on the equipment near operation locations to provide information about safety items and operation precautions. Insure that you clearly understand the meanings of the symbols and take the necessary precautions BEFORE using the equipment.

This indicates a prohibited operation. The prohibited operation is indicated symbolically in or near the barred circle.

This indicates an obligatory safety precaution. The obligatory operation is indicated symbolically in or near the circle.

This indicates warning or caution. The contents are indicated symbolically in or near the triangle.

This indicates a note. The contents are described in the box.

These indicate that the marked part should be recycled.

MS8608A/MS8609A
Digital Mobile Radio Transmitter Tester
Operation Manual Vol.2 (Spectrum Analyzer Function)

17 March 2000 (First Edition)
13 August 2001 (Fourth Edition)

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Printed in Japan

For Safety

WARNING ⚠

1. ALWAYS refer to the operation manual when working near locations at which the alert mark shown on the left is attached. If the operation, etc., is performed without heeding the advice in the operation manual, there is a risk of personal injury. In addition, the equipment performance may be reduced.
   Moreover, this alert mark is sometimes used with other marks and descriptions indicating other dangers.

2. When supplying power to this equipment, connect the accessory 3-pin power cord to a 3-pin grounded power outlet. If a grounded 3-pin outlet is not available, before supplying power to the equipment, use a conversion adapter and ground the green wire, or connect the frame ground on the rear panel of the equipment to ground. If power is supplied without grounding the equipment, there is a risk of receiving a severe or fatal electric shock.

Repair

WARNING ⚠

3. This equipment cannot be repaired by the user. DO NOT attempt to open the cabinet or to disassemble internal parts. Only Anritsu-trained service personnel or staff from your sales representative with a knowledge of electrical fire and shock hazards should service this equipment. There are high-voltage parts in this equipment presenting a risk of severe injury or fatal electric shock to untrained personnel. In addition, there is a risk of damage to precision parts.

Falling Over

4. This equipment should be used in the correct position. If the cabinet is turned on its side, etc., it will be unstable and may be damaged if it falls over as a result of receiving a slight mechanical shock.

For Safety

WARNING ⚠

Battery fluid

5. DO NOT short the battery terminals and never attempt to disassemble it or dispose of it in a fire. If the battery is damaged by any of these actions, the battery fluid may leak.
   This fluid is poisonous.
   DO NOT touch it, ingest it, or get in your eyes. If it is accidentally ingested, spit it out immediately, rinse your mouth with water and seek medical help. If it enters your eyes accidentally, do not rub your eyes, irrigate them with clean running water and seek medical help. If the liquid gets on your skin or clothes, wash it off carefully and thoroughly.

LCD

6. This instrument uses a Liquid Crystal Display (LCD); DO NOT subject the instrument to excessive force or drop it. If the LCD is subjected to strong mechanical shock, it may break and liquid may leak.
   This liquid is very caustic and poisonous.
   DO NOT touch it, ingest it, or get in your eyes. If it is ingested accidentally, spit it out immediately, rinse your mouth with water and seek medical help. If it enters your eyes accidentally, do not rub your eyes, irrigate them with clean running water and seek medical help. If the liquid gets on your skin or clothes, wash it off carefully and thoroughly.

For Safety

CAUTION ⚠

Changing Fuse

CAUTION ⚠

1. Before changing the fuses, ALWAYS remove the power cord from the poweroutlet and replace the blown fuses. ALWAYS use new fuses of the type and rating specified on the fuse marking on the rear panel of the cabinet.

   T6.3A indicates a time-lag fuse.

   There is risk of receiving a fatal electric shock if the fuses are replaced with the power cord connected.

Cleaning

2. Keep the power supply and cooling fan free of dust.
   - Clean the power inlet regularly. If dust accumulates around the power pins, there is a risk of fire.
   - Keep the cooling fan clean so that the ventilation holes are not obstructed. If the ventilation is obstructed, the cabinet may overheat and catch fire.

Input Level

3. Maximum DC voltage ratings:

   High Power Input and Low Power Input connectors: ±DC 0 V

   Maximum AC power (continuous wave) ratings:

   For MS8608A

   High Power Input connector: +40 dBm

   Low Power Input connector: +20 dBm

   For MS8609A

   +20 dBm

   NEVER input a over maximum ratings to RF Input, excessive power may damage the internal circuits.

   MS8609A is equipped with the option 32:

   +30 dBm

   ≥ ±0 Vdc

For Safety

CAUTION ⚠

Replacing Memory Back-up Battery

4. The power for memory backup is supplied by a Poly-carbonmonofluoride Lithium Battery. This battery should only be replaced by a battery of the same type; since replacement can only be made by Anritsu, contact the nearest Anritsu representative when replacement is required.

   ***Note**: The Battery life is about 7 years. Early battery replacement is recommended.*

Storage Medium

5. This equipment stores data and programs using Plug-in memory card. Data and programs may be lost due to improper use or failure. ANRITSU therefore recommends that you backup the memory.

   Anritsu Corporation will not accept liability for lost data.

   Please pay careful attention to the following points.

   - Do not remove the memory card from equipment being accessed.
   - Isolate the card from static electricity.

Equipment Certificate

Anritsu Corporation certifies that this equipment was tested before shipment using calibrated measuring instruments with direct traceability to public testing organizations recognized by national research laboratories including the Electrotechnical Laboratory, the National Research Laboratory of Metrology and the Communications Research Laboratory, and was found to meet the published specifications.

Anritsu Warranty

Anritsu Corporation will repair this equipment free-of-charge if a malfunction occurs within 1 year after shipment due to a manufacturing fault, provided that this warranty is rendered void under any or all of the following conditions.

- The fault is outside the scope of the warranty conditions described in the operation manual.
- The fault is due to mishandling, misuse, or unauthorized modification or repair of the equipment by the customer.
- The fault is due to severe usage clearly exceeding normal usage.
- The fault is due to improper or insufficient maintenance by the customer.
- The fault is due to natural disaster including fire, flooding, earthquake, etc.
- The fault is due to use of non-specified peripheral equipment, peripheral parts, consumables, etc.
- The fault is due to use of a non-specified power supply or in a non-specified installation location.

In addition, this warranty is valid only for the original equipment purchaser. It is not transferable if the equipment is resold.

Anritsu Corporation will not accept liability for equipment faults due to unforeseen and unusual circumstances, nor for faults due to mishandling by the customer.

Anritsu Corporation Contact

If this equipment develops a fault, contact Anritsu Corporation or its representatives at the address in this manual.

Notes On Export Management

This product and its manuals may require an Export License/Approval by the Government of the product's country of origin for re-export from your country.
Before re-exporting the product or manuals, please contact us to confirm whether they are export-controlled items or not.

Trade Mark

Windows is a registered trademark of Microsoft Corporation US in US and other countries.

Front Panel Power Switch

To prevent malfunction caused by accidental touching, the front power switch of this equipment turns on the power if it is pressed continuously for about one second in the standby state. If the switch is pressed continuously for one second in the power-on state, the equipment enters the standby state.

In the power-on state, if the power plug is removed from the outlet, then reinserted into it, the power will not be turned on. Also, if the lines is disconnected due to momentary power supply interruption or power failure, the power will not be turned on (enters the standby state) even if the line is recovered.

This is because this equipment enters the standby state and prevents incorrect data from being acquired when the line has to be disconnected and reconnected.

For example, if the sweep time is 1,000 seconds and data acquisition requires a long time, momentary power supply interruption (power failure) might occur during measurement and the line could be recovered automatically to power-on. In such a case, the equipment may mistake incorrect data for correct data without recognizing the momentary power supply interruption.

If this equipment enters the standby state due to momentary power supply interruption or power failure, check the state of the measuring system and press the front power switch to restore power to this equipment.

Further, if this equipment is built into a system and the system power has to be disconnected then reconnected, the power for this equipment must also be restored by pressing the front power switch.

Consequently, if this equipment is built into remote monitoring systems that use MODEMs, please install option 46 "Auto Power Recovery" to equipment.

ABOUT DETECTION MODE

This instrument is a spectrum analyzer which uses a digital storage system. The spectrum analyzer makes level measurements in frequency steps obtained by dividing the frequency span by the number of measurement data points (501 or 1001). This method of measurement cannot detect the signal peak level if the spectrum of a received signal is narrower than these frequency steps.

To resolve this problem, this instrument usually operates in positive peak detection mode and normal detection mode. In the positive peak detection mode, the highest level within the frequency range between the sample points can be held and traced. In the normal detection mode, both the positive peak and the negative peak can be traced.

Positive peak detection mode should be used for almost all measurements including normal signal level measurement, pulsed noise analysis, and others. It is impossible to measure the signal level accurately in sample detection mode or in negative peak detection mode.

Use of sample detection mode is restricted to random noise measurement, occupied frequency bandwidth measurement for analog communication systems, and adjacent-channel leakage power measurement, etc.

Measurement	Item
• Normal signal	POS PEAK
• Random noise	SAMPLE
• Pulsed noise	NORMAL (POSI-NEG)
• Occupied frequency bandwidth, adjacent-channel leakage power (for analog communication systems)	SAMPLE
• Occupied frequency bandwidth, adjacent-channel leakage power (for digital communication systems)	POS PEAK or SAMPLE

When a detection mode is specified as one of the measurement methods, make the measurement in the specified detection mode.

CE Marking

Anritsu affixes the CE Conformity Marking on the following product (s) in accordance with the Council Directive 93/68/EEC to indicate that they conform with the EMC directive of the European Union (EU).

CE Conformity Marking

CE

1. Product Name/Model Name

Product Name: Digital Mobile Radio Transmitter Tester
Model Name: MS8608A/MS8609A

2. Applied Directive

EMC: Council Directive 89/336/EEC
LVD: Council Directive 73/23/EEC

3. Applied Standards

EMC:

Emission: EN61326: 1997/A1: 1998 (Class A)
Immunity: EN61326: 1997/A1: 1998 (Annex A)

	Performance Criteria*
IEC61000-4-2 (ESD)	B
IEC61000-4-3 (EMF)	A
IEC61000-4-4 (Burst)	B
IEC61000-4-5 (Surge)	B
IEC61000-4-6 (CRF)	A
IEC61000-4-8 (RPFMF)	A
IEC61000-4-11 (V dip/short)	B

*: Performance Criteria

A: During testing normal performance within the specification limits.

B: During testing, temporary degradation, or loss of function or which is self-recovering.

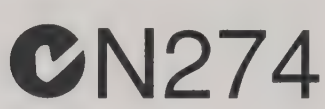
Harmonic current emissions:

EN61000-3-2: 1995/A2: 1998 (Class A equipment)

LVD:EN61010-1: 1993/A2: 1995 (Installation Category II, Pollution Degree 2)

Anritsu affixes the C-tick marking on the following product (s) in accordance with the regulation to indicate that they conform with the EMC framework of Australia/New Zealand

C-tick marking



1. Product Name/Model Name

Product Name: Digital Mobile Radio Transmitter Tester
Model Name: MS8608A/MS8609A

2. Applied Standards

EMC:

Emission:

AS/NZS 2064.1/2 (ISM, Group 1, Class A equipment)

Immunity:

AS/NZS 4252.1

	*Performance Criteria
IEC61000-4-2 (ESD)	B
IEC61000-4-3 (EMF)	A
IEC61000-4-4 (Burst)	B
IEC61000-4-5 (Surge)	B
IEC61000-4-6 (CRF)	A
IEC61000-4-8 (RPFMF)	A
IEC61000-4-11 (V dip/short)	B

*: Performance Criteria

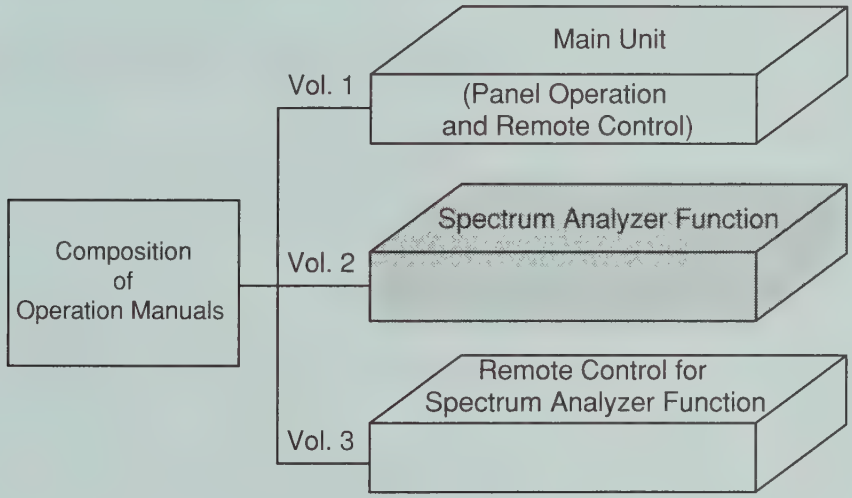
A: During testing normal performance within the specification limits.

B: During testing, temporary degradation, or loss of function or which is self-recovering.

About This Manual

Composition of MS8608A/MS8609A Digital Mobile Radio Transmitter Tester Operation Manuals

The MS8608A/MS8609A Digital Mobile Radio Transmitter Tester operation manuals of the standard type are composed of the following three documents. Use them properly according to the usage purpose.



Main Unit:

Provides information on the MS8608A/MS8609A outline, preparation before use, panel description, basic operation, softkey menu of the commonly-used functions, performance tests and remote control for the main unit.

Spectrum Analyzer Function:

Spectrum Analyzer Function: Provvides information on operating the spectrum analyzer function of the MS8608A/MS8609A.

Remote Control for Spectrum Analyzer Function:

Remote Control for Spectrum Analyzr Function: Provides information on remotely-operating the spectrum analyzer function of the MS8608A/MS8609A using an external controllr.

For the operating instructions to use the MS8608A/MS8609A as a transmitter tester, refer to the separate operation manuals of the measurement software.

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Section 1 Basic Operation Procedure

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The basic operation procedure of this equipment are explained here. The operations are listed on the right. Also, the explanation will advance assuming that a 500 MHz signal is applied to the input connector. Please refer to this manual while operating this equipment.

(▭ : Panel key, ___ : Soft key)

<Actual operations>

(I) Signal display
  1) Turn the power on,
  2) Move to spectrum analyzer mode,
  3) Execute automatic calibration,
  4) Set the signal to the center of the screen, and
  5) Enlarge and display the signal.

(II) Marker operation
  Check of the zone marker function.
  The "marker → CF" function check.

(III) "Measure" function check

(IV) Screen hard copy

Signal Display

Turn the power on

Press the standby button on the rear panel, then press the power switch on the front panel. In this case, continue pressing the power switch for one second or more.

The power is turned on/off only when the power switch is pressed for one second or more. This prevents the power from being turned on/off easily by mistake.

Move to spectrum analyzer mode

Press Spectrum key.

Pressing this (Spectrum) key moves any mode to the spectrum analyzer mode. In the spectrum analyzer mode, the transmitter tester function (using a measurement software) cannot performed.

Press (Preset) key.

Press Preset All key in the menu.

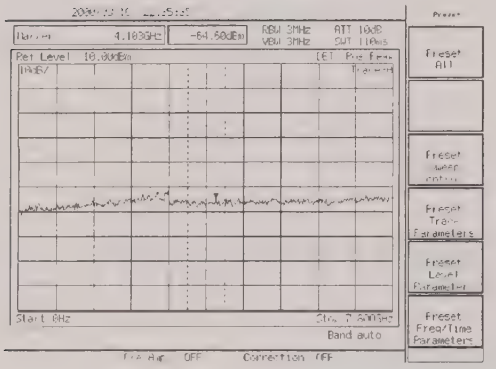

Fig. 1-1

Rule and feature of operation

When (panel) key (hard key) is pressed, the related soft key menu is displayed.

Partial resettings are enabled. This resetting includes only the display-related resetting or the resetting of special modes such as zone sweep.

Execute automatic calibration

Wait after switching on the power supply of the machine (warm up period) till the internal temperature becomes stable. This period is approximately 10 minutes.

After warm up, execute automatic calibration.

Press (Shift) (GHz) key.

Select All Cal from the menu displayed on the display.

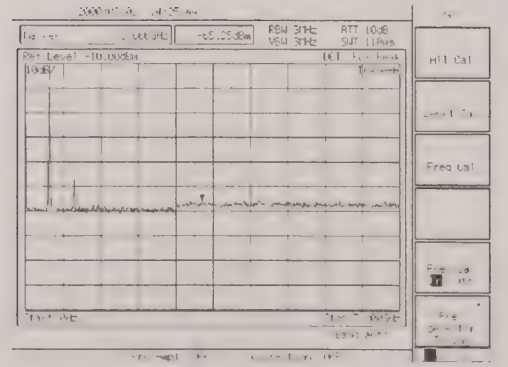

Fig. 1-2

Automatic Calibration is carried out by using an internal source without need for any external cable connection.
Refer to "Detailed Operation Instructions" for detail information about contents of calibration.

Set the signal to the center of the screen

Press (Freq/Channel) key.

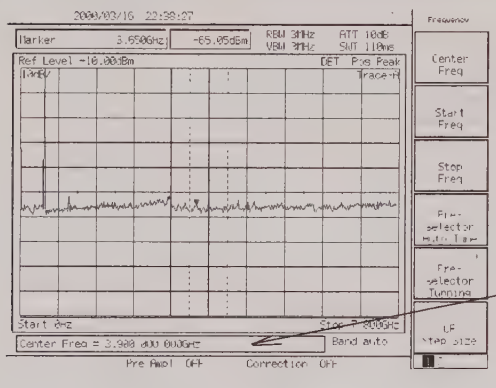

Fig. 1-3

When pressing Frequency, Span, Amplitude or Coupled Function key (s) which is used frequently, Center Frequency, Span, Reference Level, or RBW function is selected and numeric value for the function can be entered into Entry area. This reduce key operation times.

This display section is called Entry area. Selecting the menu displays the current set value of the parameter. The set value can be changed by entering data in Entry area.

Press (Shift) (GHZ) (Hold) key

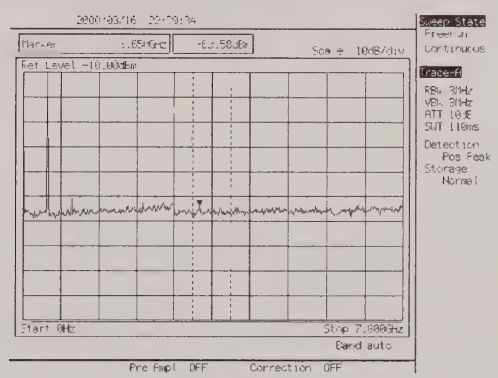

Fig. 1-4

The display of the soft key menu can be switched on/off using (Shift) (GHZ) (Hold) key. When the menu disappears, the set up parameters are displayed.

Press (Freq/Channel) key, then use the ten-key pad (numeric keys) to enter (5) (0) (0) (MHz). The center frequency becomes 500 MHz.

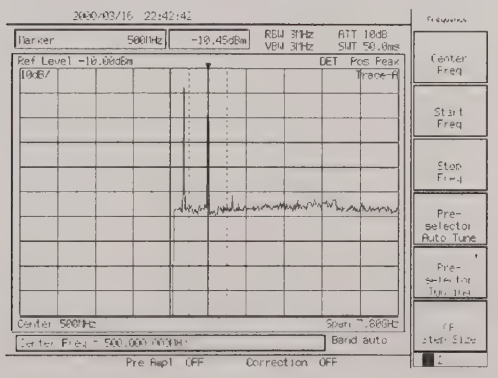

Fig. 1-5

The following three methods to input numeric values to parameters are provided: direct input by the ten-key pad (numeric keys), up/down keys, and rotary knob.

Enlarge and display the signal

Press (Span) key , then press the (▽) down key several times to enlarge the signal display.

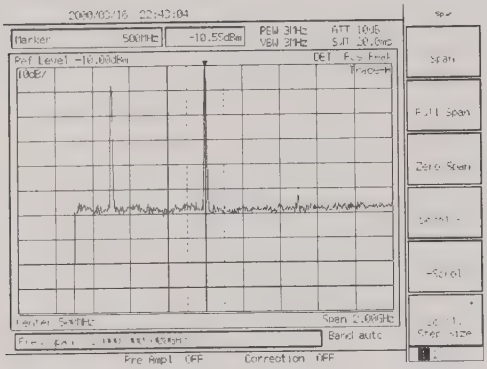

Fig. 1-6

Marker Operation

Here, check that the signal frequency and level are displayed in a marker display area. The zone marker automatically fetches the highest level signal within the zone and displays the frequency and level.

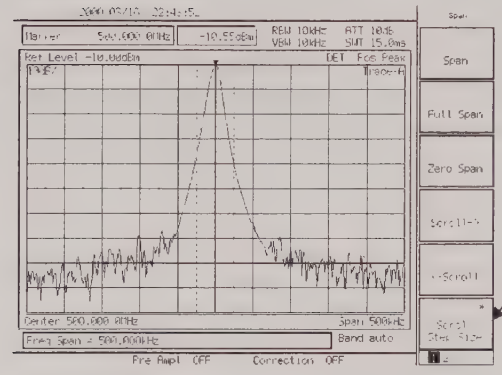

Fig. 1-7

The following items can easily be checked by the soft key menu tab: How many pages of the soft key menu being displayed currently are there?, and what page is displayed now?

To turn over the page, press (More) key.

To check Marker → CF function, shift the signal from the center intentionally. Press (Span) key, and then Scroll → key two times.

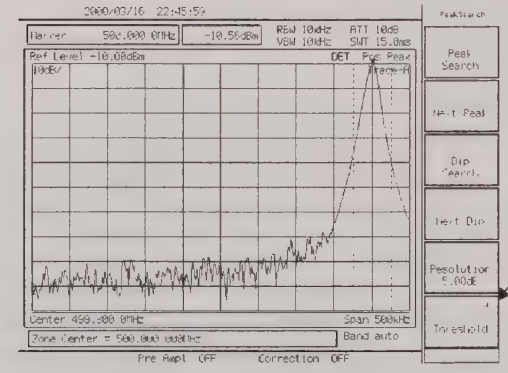

Fig. 1-8

The soft key menu marked by an asterisk on the upper right indicates that the menu can further be opened by pressing the key. Adversely, the soft key menu not marked indicates that the menu cannot be opened any more, so to speak, the end of menu opening.

Press (Peak Search) key.

Then, press Peak Search function key.

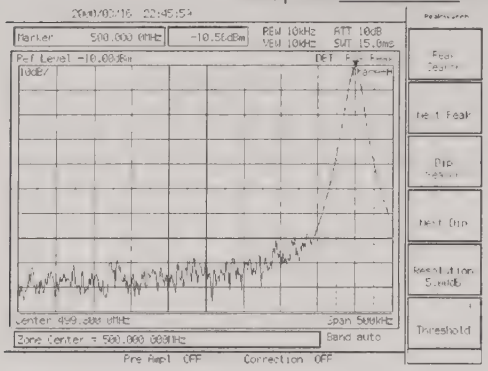

Fig. 1-9

*Advanced operation memo: It is convenient that the page can also be turned over by repeatedly pressing the panel key. This method is used when key (s), such as (Measure) key, has a number of pages. Besides, the Freq/Ampl and Marker-related keys do not turn over the page by repeatedly pressing the panel key. For these keys, because the first page is important specially, it should always be displayed when the panel key is pressed.

The marker fetches the signal.

Press (Shift) (Peak Search) (Marker →) key.

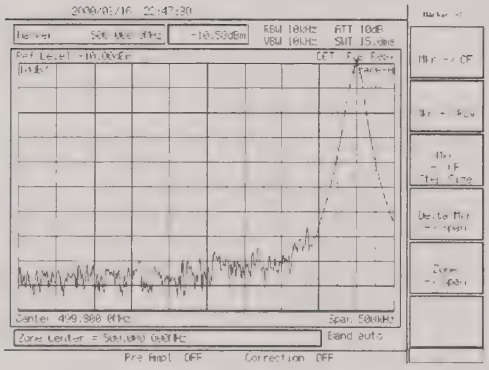

Fig. 1-10

Press marker → CF key.

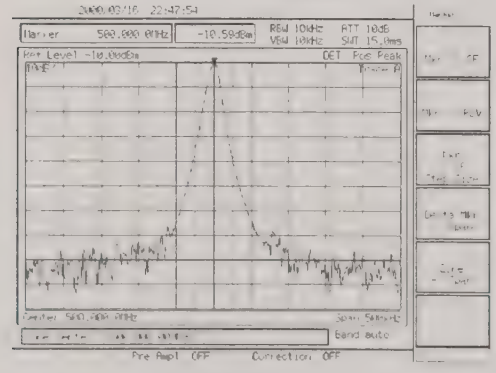

Fig. 1-11

The page opened by pressing the soft key can return to the preceding page by the Return key. Besides, it can be checked that which soft key menu was pressed previously to open the current menu, as the menu title is displayed on the upper row of the soft key.

Here, return to the screen of Fig. 1-8 and ensure that the screen changes to that of Fig. 1-11 only by pressing the (→ CF) key.

"Measure" Function Check

Press (Preset) key and Preset All key in order.
Press (Peak Search) key.
If the zero beat signal level (local feed through) is larger than the signal level and the marker fetches the zero beat level, press Next Peak key and put the marker on the signal.

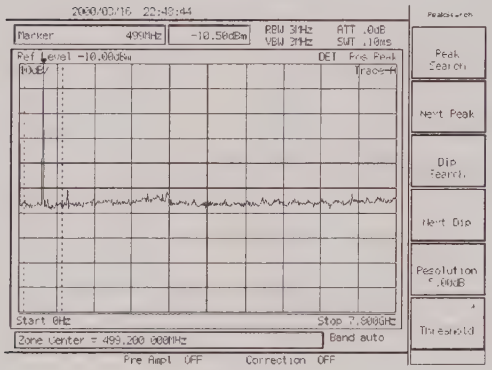

Fig. 1-12

Press the (Measure) key and Frequency Count key to set the function of high accuracy frequency measurement of the marker points.
Then, press the Count On key and start measurement.

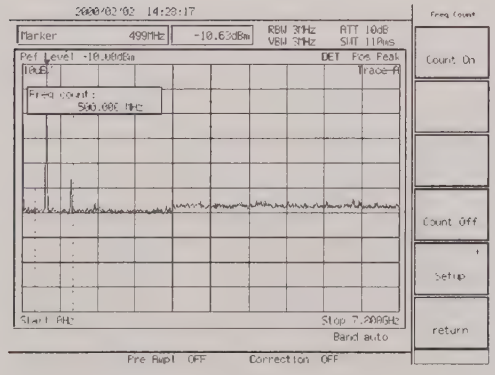

Fig. 1-13

From the screen after executing measurement, press another panel key and change parameters, and then, pressing again the (Measure) key will automatically return to the menu of this screen and not to page 1 of the menu (page learning function).
It is a useful function when repeating measurement.

The frequency of marker point is displayed at the top left of the screen.
Incidentally, the internal counter correctly operates even at the full span condition, so an operation to reduce frequency span otherwise required is not necessary in this model.

Shifting of result position

Press (Measure) key and Result Position* key in order.
User can select a displayed position of measured result from 4 patterns. Displayed position is upper right, upper left, lower right, or lower left.

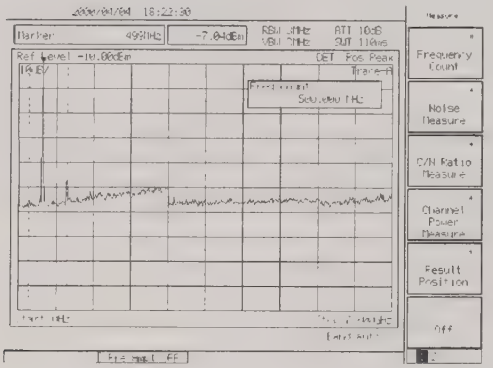

Fig. 1-14

Screen Hard Copy

The screen can be hard-copied with the BJ-M70 printer (Cannon) via a Centronics interface, and the procedures are described below:

1) As illustrated below, connect the Prallel connector and printer with an attached Parallel cable.

2) Press the (Copy) key, and the currently displayed screen is hard-copied.
If the printed copy is improper, check if the interface is correctly set in the following sequence.

3) Press the (Config) key.

4) Press the STEPDOWN (∨) key several times to get Copy Control, and check if the copy to is Printer. If the copy to is not Printer, set the cursor to Printer with the knob and press the (set) key .

5) Check if the printer setup is BJ-M70 (ESC/P). (For the setting and confirming the printer mode, refer to the separate printer operation manual. Only the ESC/P mode can be used for the MS8608A/MS8609A.)

6) Press the (Spectrum) key and return to the spectrum screen.

7) Press the (Copy) key, and the currently displayed screen is hard-copied.

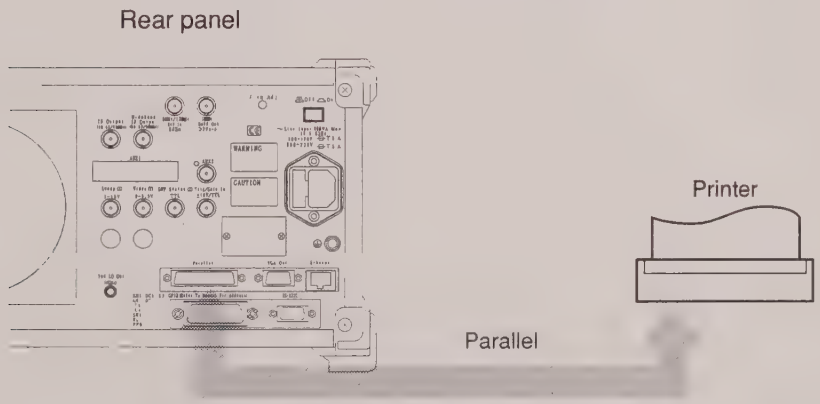

Fig. 1-14

Section 2 Frequency/Amplitude Data Entry

This section describes the data entry function related to frequency and amplitude in the Freq/Ampl section on the front panel.

Setting Observation Frequency 2-3
- Soft menu in Freq/Channel key 2-4
- Center-Span Mode 2-5
- Start-Stop Mode 2-6
- Setting Step Size with Step Keys 2-7
- Fixing the frequency bands 2-8
- Soft menu in Span key 2-9
- Setting Full Scan 2-10
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- Setting Frequency Scroll Step Size 2-11

Setting Level Range 2-12
- Soft menu in Amplitude key 2-13
- Setting Log/Linear Scale 2-14
- Selecting Reference Level Units 2-15
- Selecting Input Impedance 2-15
- Setting Reference Level 2-16
- Setting Reference Level Step Size 2-17

Offsetting Reference Level 2-18
- Setting 50 Ω→75 Ω Impedance Transformer (MA1621A) 2-20
- Setting Level Frequency Correction Coefficient 2-21

Setting Observation Frequency

The observation frequency of the spectrum analyzer is set in the following two modes:

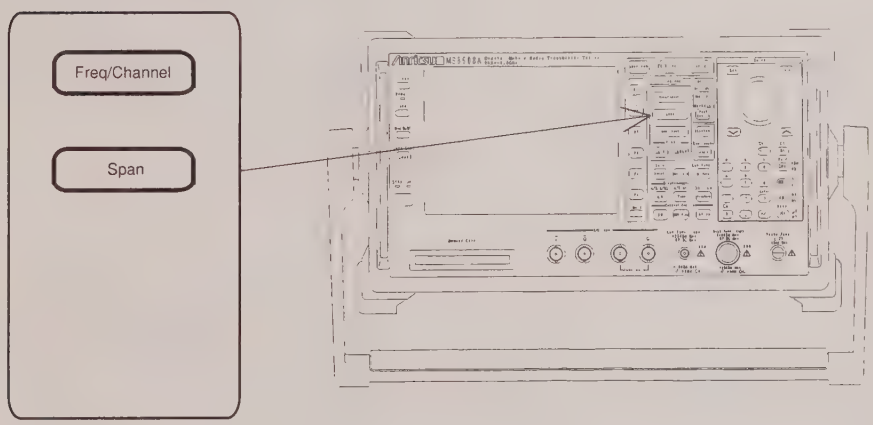
- Center-Span
- Start-Stop

The frequency setting upper and lower limits are as follows:

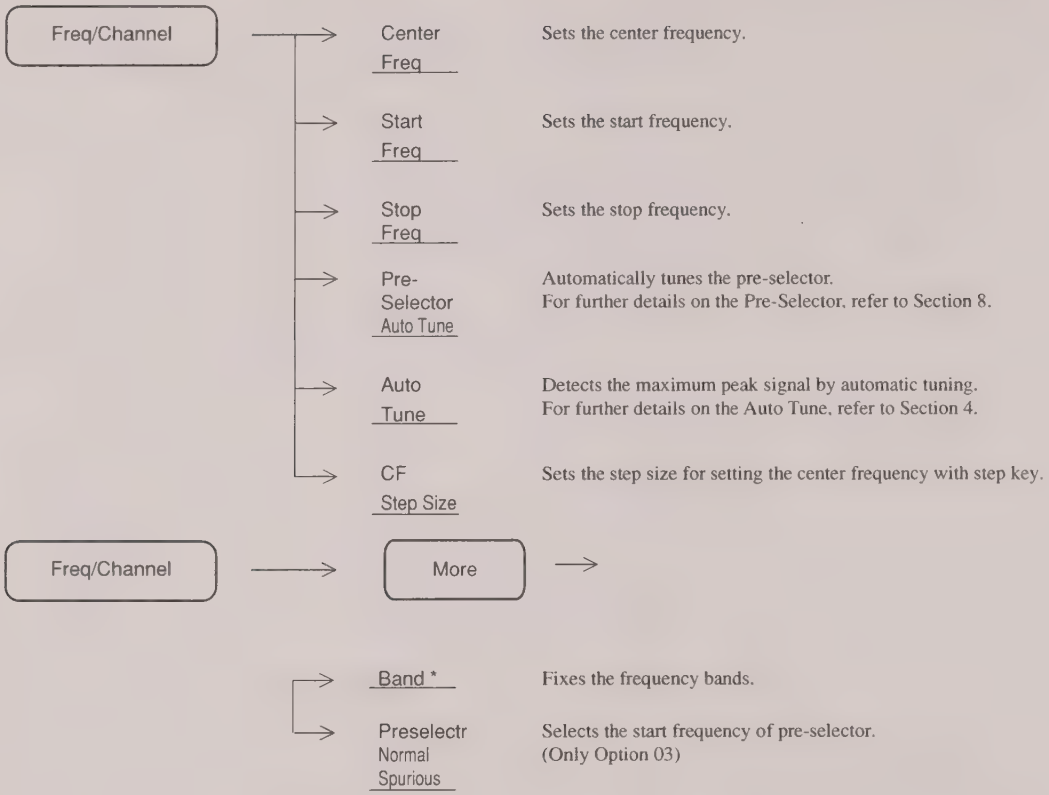
0 Hz to 7.8 GHz for MS8608A

0 Hz to 13.2 GHz for MS8609A

The Freq/Channel key is used as the header key for setting the frequency, and the Span key is used as the header key for setting the frequency span.

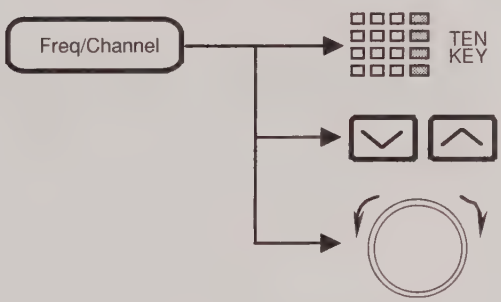


Soft menu in Freq/Channel key


Freq/Channel
Center Freq
Sets the center frequency.
Start Freq
Sets the start frequency.
Stop Freq
Sets the stop frequency.
Pre-Selector Auto Tune
Automatically tunes the pre-selector.
For further details on the Pre-Selector, refer to Section 8.
Auto Tune
Detects the maximum peak signal by automatic tuning.
For further details on the Auto Tune, refer to Section 4.
CF Step Size
Sets the step size for setting the center frequency with step key.
Freq/Channel
More
Band *
Fixes the frequency bands.
Preselectr Normal Spurious
Selects the start frequency of pre-selector.
(Only Option 03)

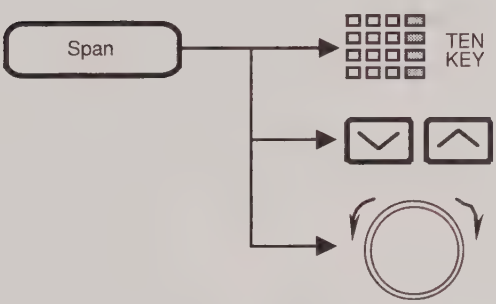
Center-Span Mode

(1) Setting center frequency

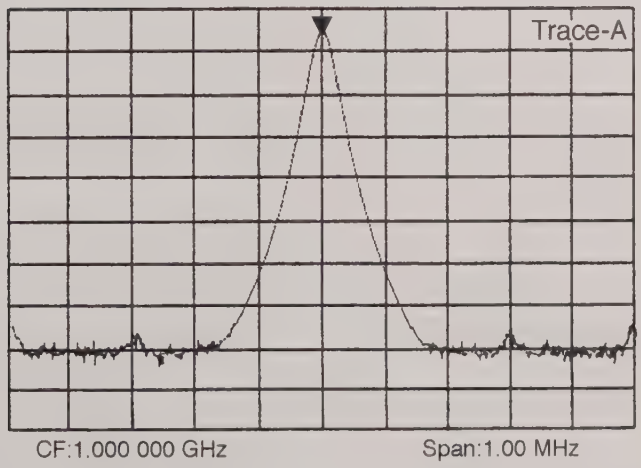


(Use the CF Step Size key to set the step size.)

(2) Setting frequency span



(1/2/5 sequence)



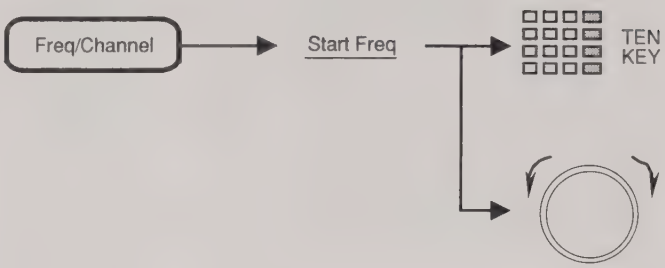
Note:

Warming up is necessary until the observation frequency becomes stable after turning on the power.

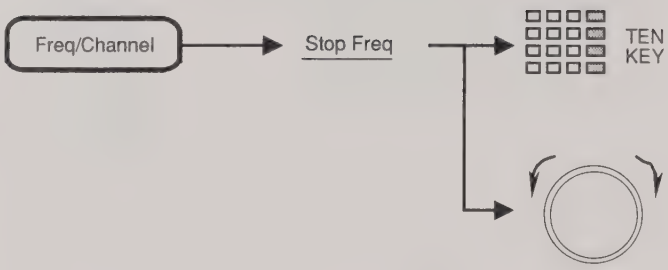
When "Warm Up" message is being indicated at the top right corner of the indicator, please wait for approximately 3 minutes, and start the measurements after the message disappears.

Start-Stop Mode

(1) Start frequency

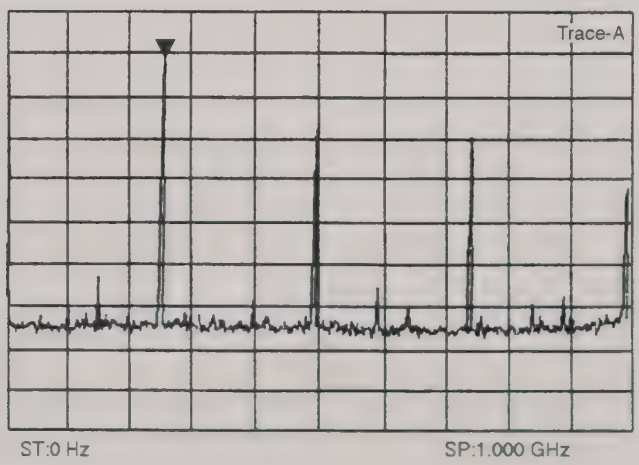


(2) Stop frequency

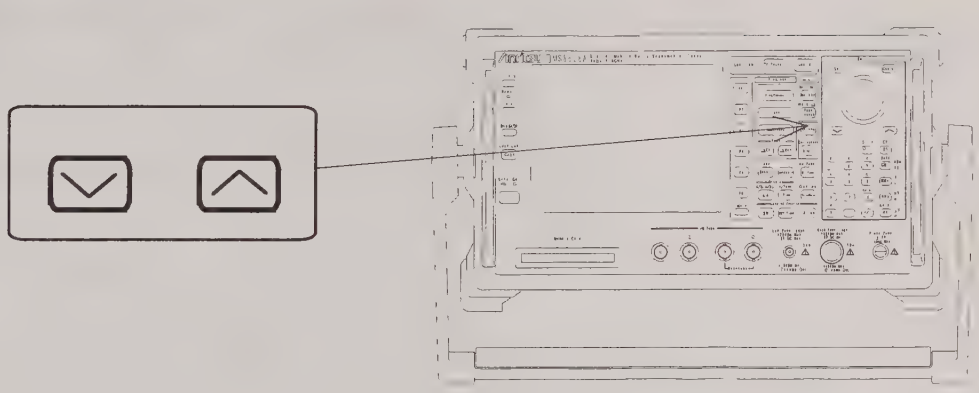


Notes:

- Because the ∨ and ∧ keys are the step keys for the center frequency, the start and stop frequencies are also changed.
- The stop frequency may also vary depending on the values of the frequency span setting resolution and start frequency.



Setting Step Size with Step Keys



To use the ▽ △ keys to change the step size of the center frequency, register the step size as follows:

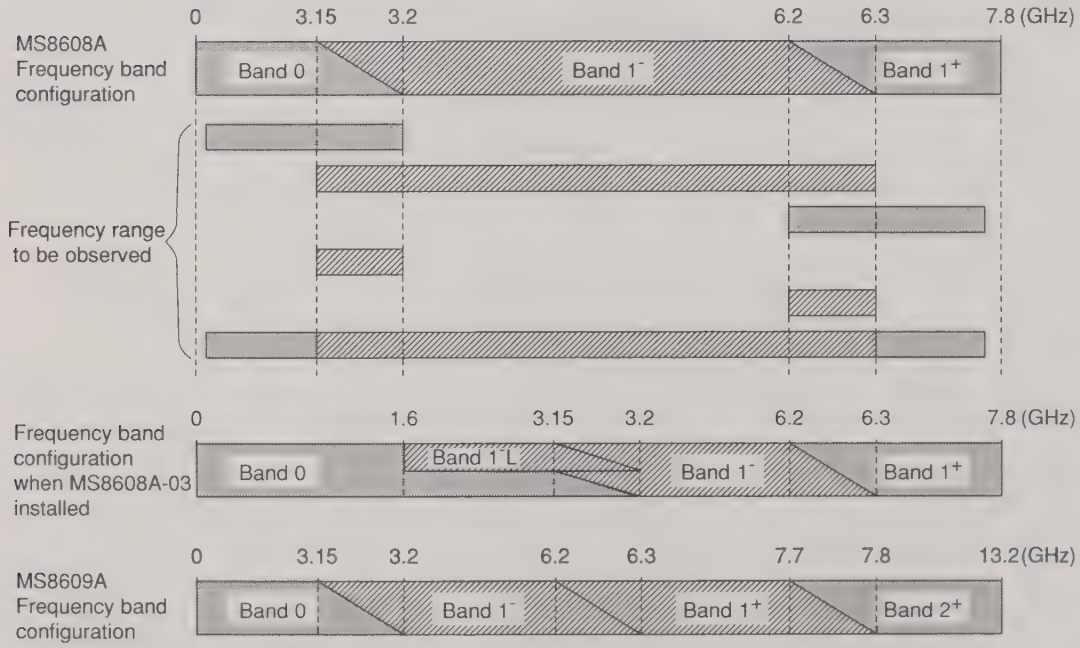
Freq/Channel → CF Step Size → TEN KEY

Fixing the frequency bands

In the MS8608A/MS8609A, the 0 to 7.8 GHz/13.2 GHz frequency range consists of the following bands:

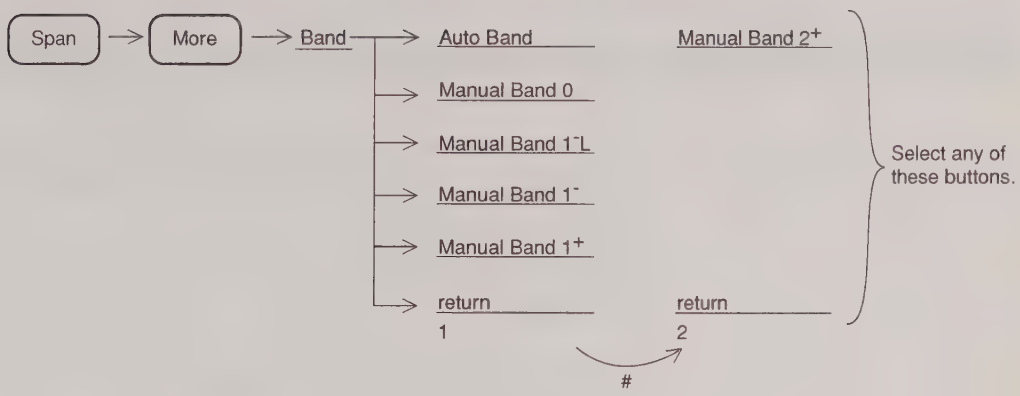
- Band 0 ..... .0 to 3.2 GHz
- Band 1^-L ..... 1.6 to 3.2 GHz (only for MS8608A-03 installed)
- Band 1^- ..... 3.15 to 6.3 GHz
- Band 1^+ ..... 6.2 to 7.8 GHz
- Band 2^+ ..... 7.7 to 13.2 GHz (only for MS8609A)

In the initial state, the Auto Band mode that is operated by selecting the optional frequency band is selected according to the range of frequencies to be observed.



Selection of frequency bands according to range of frequencies to be observed in Auto Band mode

Perform the following to fix the frequency band, for example, when the frequency is near the band-switching portion.

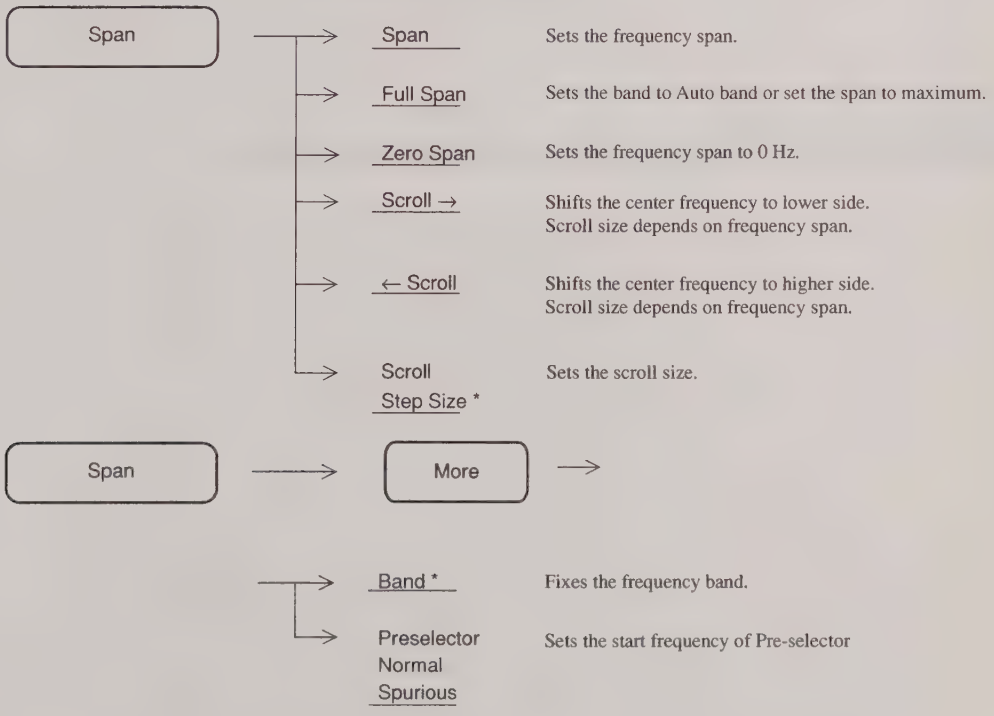


Press # (More) to turn over the page.

Note that Band 1^{-}L is enabled when the MS8608A Option 03 installed.

Band 2^{+} is enabled only for the MS8609A.

Soft menu in Span key



Setting Full Scan

In the normal operating state, pressing the Preset key allows the entire frequency range of the spectrum analyzer to be swept over the full span. However, this setting also initializes the parameters except the frequency range.

To set the full span and leave the other parameters unchanged, perform the following key operations.

Span → Full Span

Auto band, 0 to 7.8 GHz (MS8608A)
0 to 13.2 GHz (MS8609A)
For Band 0, 0 to 3.2 GHz
For Band $1^{-}L$, 1.6 to 3.2 GHz (when MS8608A-03 installed)
For Band 1^{-}, 3.15 to 6.3 GHz
For Band 1^{+}, 6.2 to 7.8 GHz
For Band $1^{-}L$, 7.7 to 13.2 GHz (when MS8609A installed)

Setting Zero Span

The Spectrum Analyzer can operate as a selective level meter in which the horizontal axis is graduated as a time axis by setting the frequency span to 0 Hz. The rising and falling edges of burst waves can also be observed and measured.

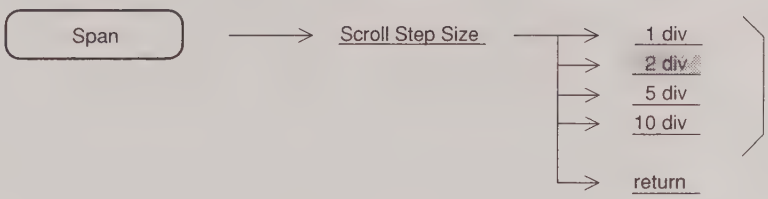
Performing any of the following key operations allows the spectrum analyzer to operate in the zero span (time domain) mode.

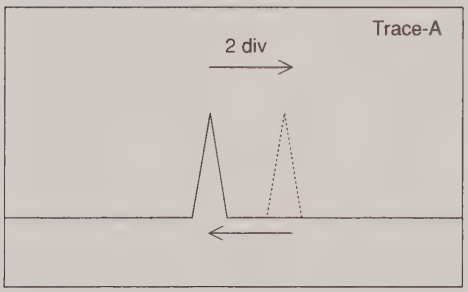
- Span → 0 → Hz
- Span → Zero Span
- Time

For further details on the zero span (time domain) mode, refer to Section 5 "Selecting the Display Method."

In the frequency and time domains, the RBW, VBW, Sweep time and other coupling functions time can be set to different values. For further details, refer to Section 7 "Coupled Function."

Setting Frequency Scroll Step Size





Span → Scroll→

The waveform scrolls 2 divs to the right.

Span → ←Scroll

The waveform scrolls 2 divs to the left.

Setting Level Range

The table below shows the types of level display modes and the ranges of the reference level (top graticule of the amplitude scale) for the different modes.

Display mode	Units	Reference Level range (Low)	Reference Level range (High)
Log scale	dBm	–120 to +40 dBm	–100 to +50 dBm
	dBµV	–13 to +147 dBµV	+7 to +157 dBµV
	dBmV	–73 to 87 dBmV	–53 to 97 dBmV
	V	224 nV to 22.4 V	2.24 µV to 70.7 V
	dBµV (emf)	–7 to +153 dBµV	+13 to +163 dBµV (emf)
	W	1 fW to 10.0 W	+100 fW to 100 W
	dBµV/m	–13 dBµV/m to +147 dBµV/m	+7 dBµV/m to +157 dBµV/m
Linear scale	V	22.4 µV to 22.4 V	224 µV to 70.7 V

For 50 Ω (standard) and MS8608A. MS8609A is the same as Low of MS8608A.

dBm: dBm unit system where 1 mW/50 Ω or 75 Ω is defined as 0 dBm.

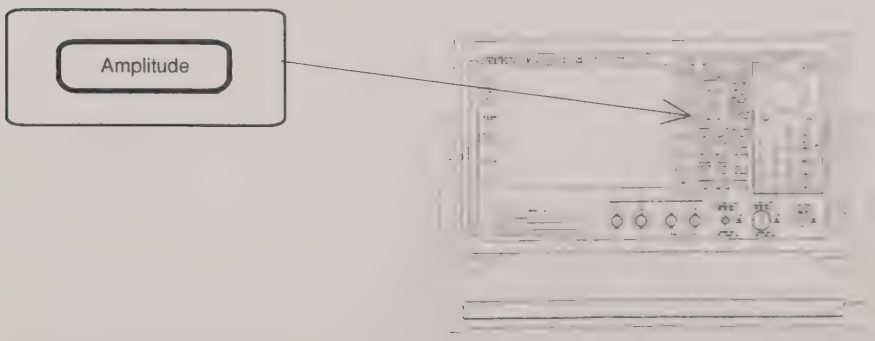
dBµV: dBµV unit system where 1µV is defined as 0 dBµV, and the terminal voltage display is terminated into 50 Ω or 75 Ω.

dBmV: dBmV unit system where 1 mV is defined as 0 dBmV, and the terminal voltage display is terminated into 50 Ω or 75 Ω.

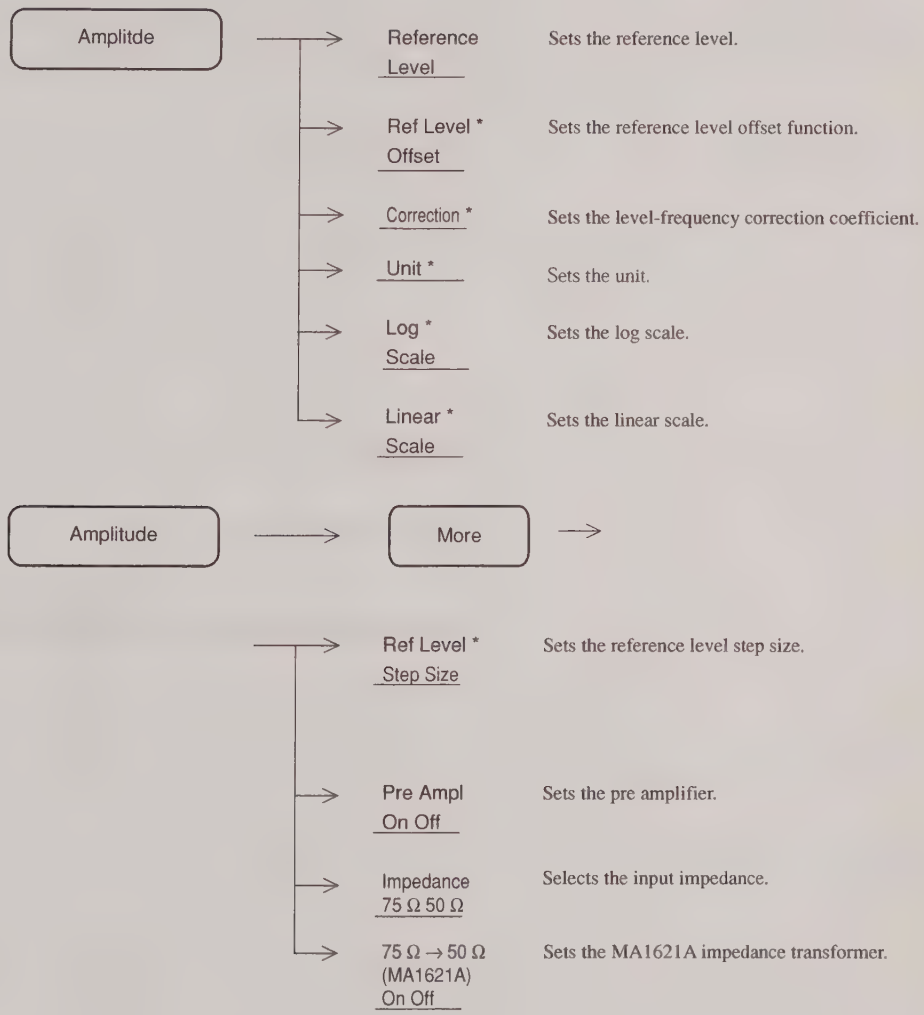
dBµV (emf): dBµV (emf) unit system based on the open-voltage display, and dBµV +6 dB is fed as the output value.

dBµVm: dBµVm unit system to indicate the electric field strength, where the displayed value depends on the antenna factor to be used.

The Amplitude key is used as the header key for setting the amplitude level.



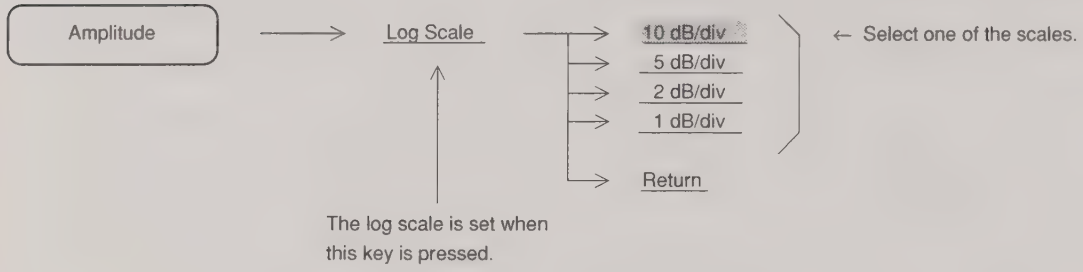
Soft menu in Amplitude key



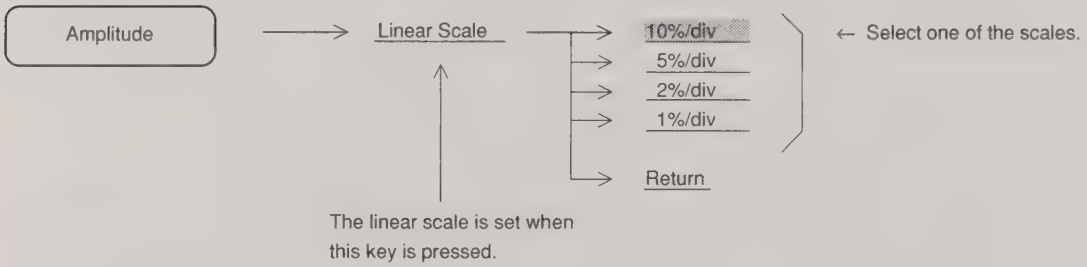
Setting Log/Linear Scale

To set the amplitude scale to log scale or linear scale, perform the following key operations.

(1) Setting log scale



(2) Setting linear scale

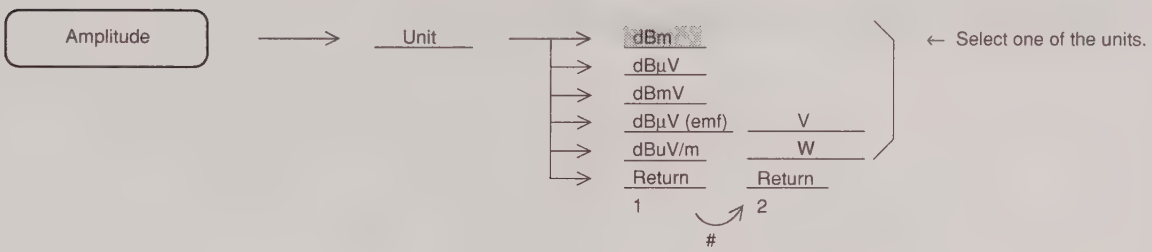


The reference level remains constant, independent of switching between log and linear scales.

When the reference level is set to less than –80 dBm in the log scale mode, the reference level of the linear scale is switched to 22.4 μV/50 Ω or 27.4 μV/75 Ω.

Selecting Reference Level Units

In the log scale mode, the spectrum analyzer provides seven types of reference level units: dBm, dBμV, dBmV, V, dBμV (emf), dBμV/m, and W. To select one of the reference level units, perform the following key operations.



To turn the page, press the (More) key.

Because the reference level unit used for the linear scale is only V, there is nothing to select.

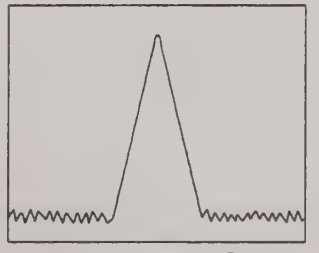
Selecting Input Impedance

This function is an standard: 50 Ω model dedicated function.

The input impedance of the spectrum analyzer is 50 Ω. Measurement with 75 Ω can be enabled by using 50 Ω→75 Ω Impedance Transformer. In this case, measured value is level converted.

When the input impedance is set to 75 Ω as shown in the figure below; measured value is level converted, and displayed according to the level unit of the dBμV/dBmV/dBμV (emf)/V.

When the input impedance is set to 75 Ω, the level is displayed after adding +1.8 dB to the 50 Ω level, and "75 ohm" is displayed at the bottom left of the waveform.

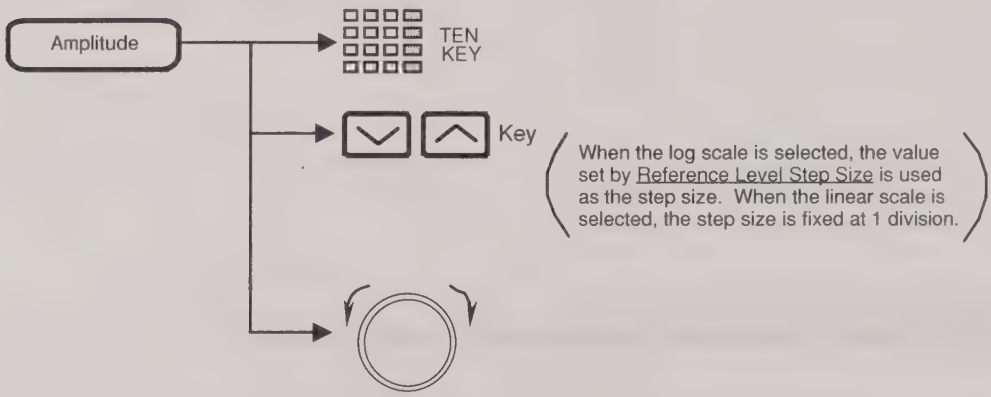


Impedance 75 Ω

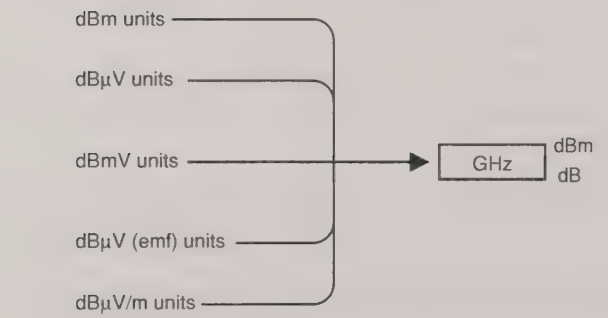
When the MA1621A is used as the 50 Ω→75 Ω Impedance Transformer, the insertion-loss frequency characteristics of the MA1621A must be compensated. The spectrum analyzer has the level-compensation function. (Refer to p.2-20 "Setting 50 Ω→75 Ω Impedance Transformer (MA1621A)".)

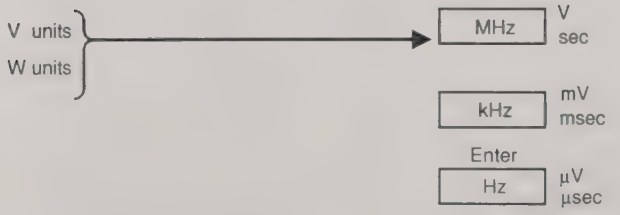
Setting Reference Level

Select the reference level (top graticule of the amplitude scale) by performing the following key operations.


Amplitude
TEN KEY
Key
When the log scale is selected, the value set by Reference Level Step Size is used as the step size. When the linear scale is selected, the step size is fixed at 1 division.

Use the unit key as follows, according to the set reference level unit.



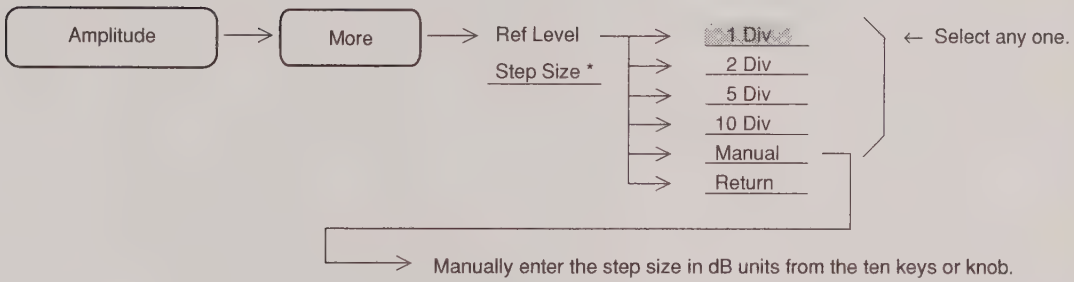


(For W units, read V as W.)

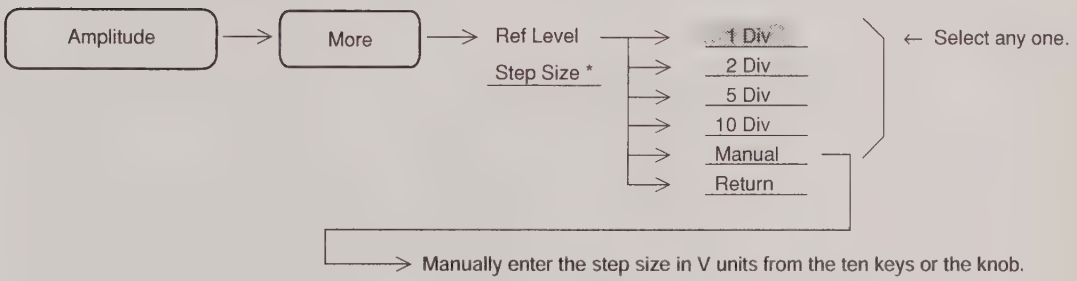
Setting Reference Level Step Size

To change the reference level with the ∨ ∧ keys, set the step size by performing the following key operations.

(1) Log scale

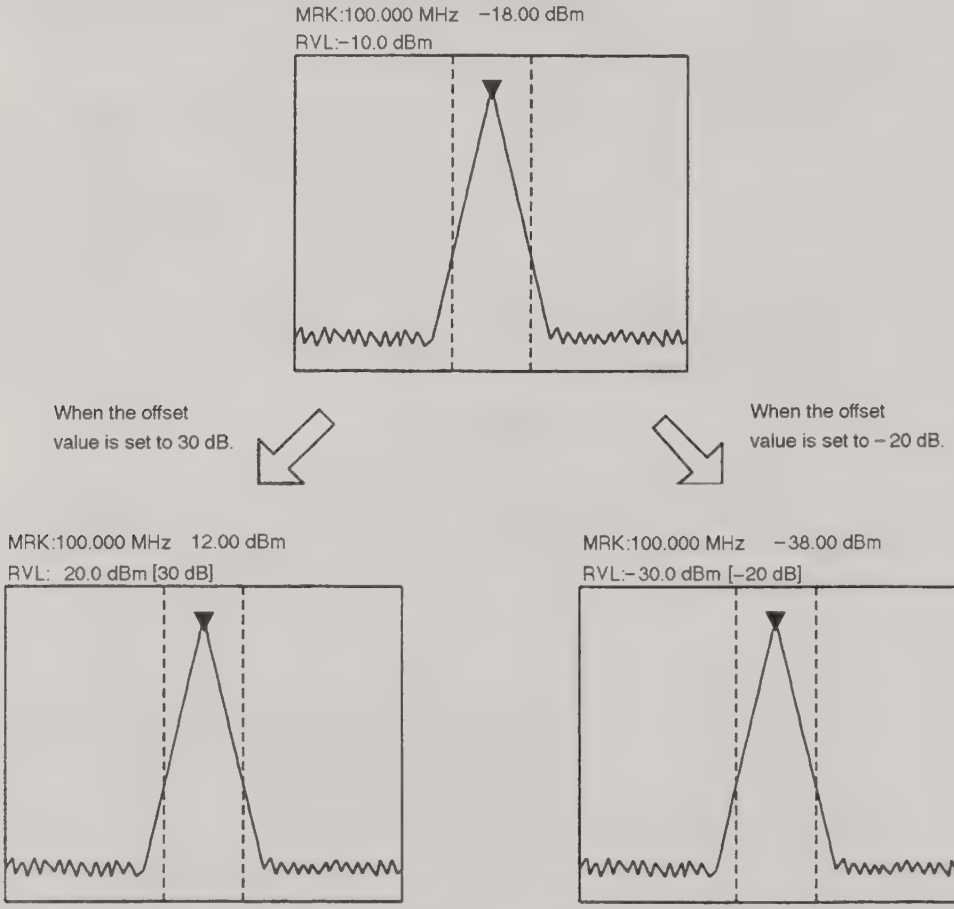


(2) Linear scale



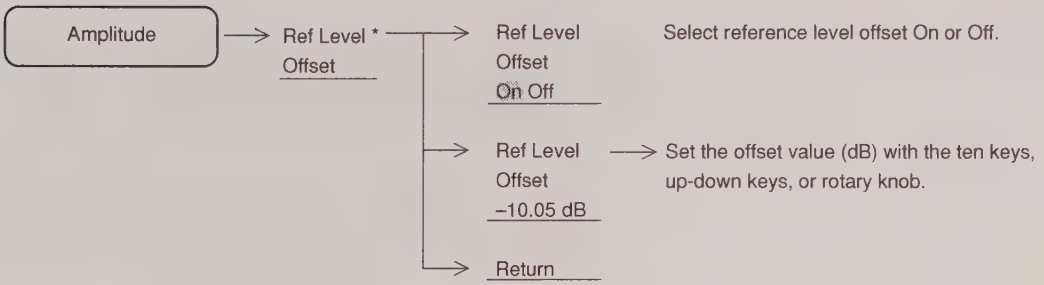
Offsetting Reference Level

The reference level and waveform trace can be displayed by adding a given offset.


MRK:100.000 MHz −18.00 dBm
RVL:−10.0 dBm
When the offset value is set to 30 dB.
When the offset value is set to −20 dB.
MRK:100.000 MHz 12.00 dBm
RVL: 20.0 dBm [30 dB]
MRK:100.000 MHz −38.00 dBm
RVL:−30.0 dBm [−20 dB]

The offset value is displayed in [ ] at the right of the reference level displayed above the scale.

Turn the offset display On/Off and set its offset value by performing the following key operations.



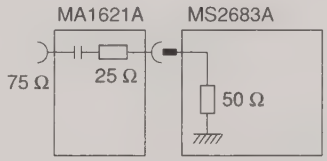
The offset value setting range is from –100 to +100 dB. The offset value resolution is 0.01 dB.

Setting 50 Ω→75 Ω Impedance Transformer (MA1621A)

When the optional MA1621A (50 Ω→75 Ω) impedance transformer is installed to the RF input attenuator (see the figure below), set the input impedance to 75 Ω.

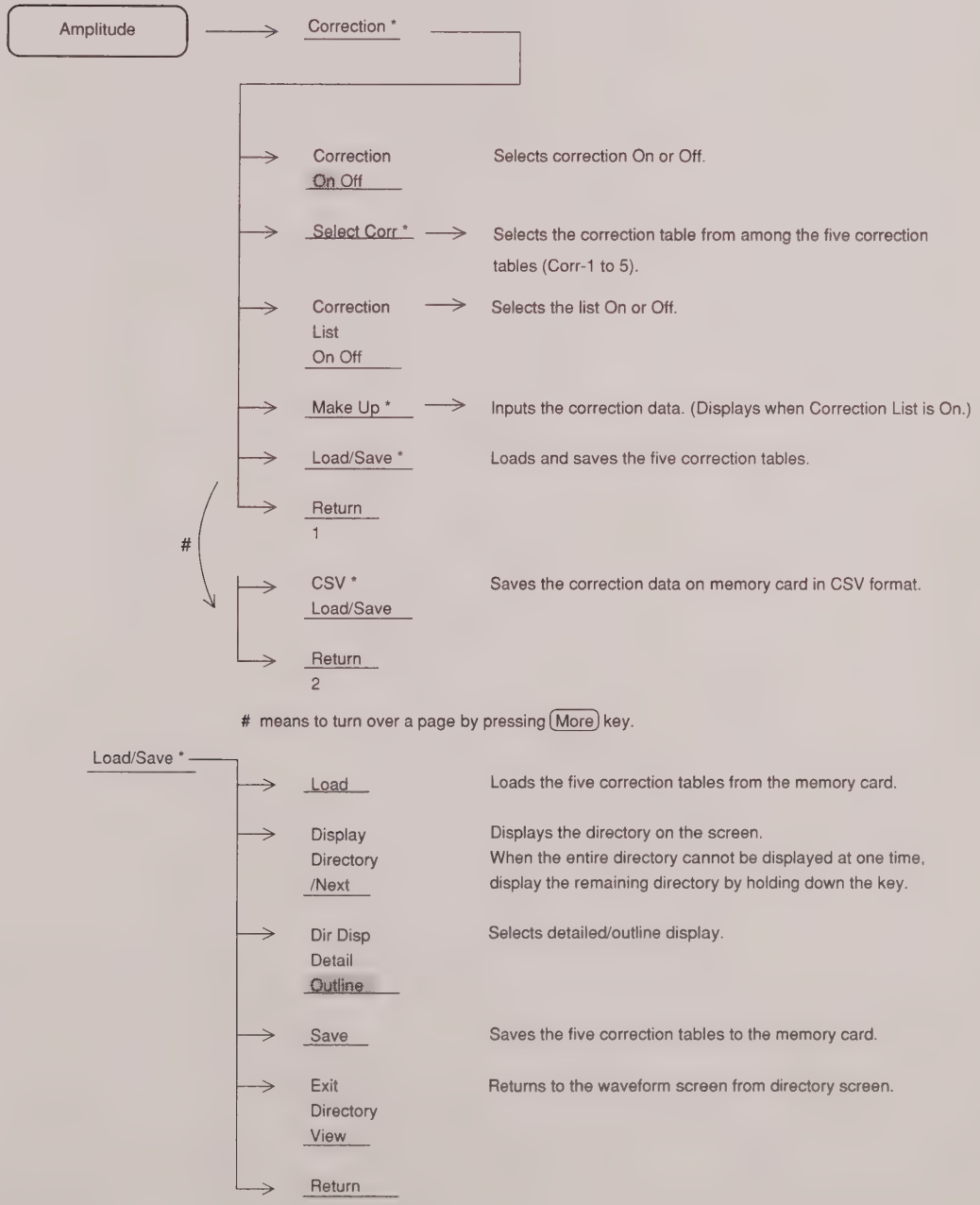
Press the (Amplitude) key, then press (More) key. Press 75 Ω→50 Ω (MA1621A) On Off key to set the MA1621A to On.

When the input impedance is set to On; it is assumed that a 25 Ω resistor is connected in series with the input, the level is converted for 75 Ω, the insertion-loss frequency characteristic is corrected, and then the measured result is displayed.



Setting Level Frequency Correction Coefficient

This function corrects the level-frequency characteristics of the cables and pads (connected to the front end of the RF Input connector) so that the level becomes flat. Correction tables are written via the RS-232C, GPIB or Ethernet interface.


Amplitude
Correction *
Correction On Off
Selects correction On or Off.
Select Corr *
Selects the correction table from among the five correction tables (Corr-1 to 5).
Correction List On Off
Selects the list On or Off.
Make Up *
Inputs the correction data. (Displays when Correction List is On.)
Load/Save *
Loads and saves the five correction tables.
Return 1
#
CSV * Load/Save
Saves the correction data on memory card in CSV format.
Return 2
means to turn over a page by pressing More key.
Load/Save *
Load
Loads the five correction tables from the memory card.
Display Directory /Next
Displays the directory on the screen.
When the entire directory cannot be displayed at one time, display the remaining directory by holding down the key.
Dir Disp Detail Outline
Selects detailed/outline display.
Save
Saves the five correction tables to the memory card.
Exit Directory View
Returns to the waveform screen from directory screen.
Return

For further details, refer to Section 8.

Section 3 Marker Functions

This section describes the marker functions for improving the measurement efficiency, such as the zone marker, marker mode menu, marker search, and the parameters set by marker value.

For a description of marker tracking and zone sweep setting, refer to Section 6 "Selecting the Sweep Method."

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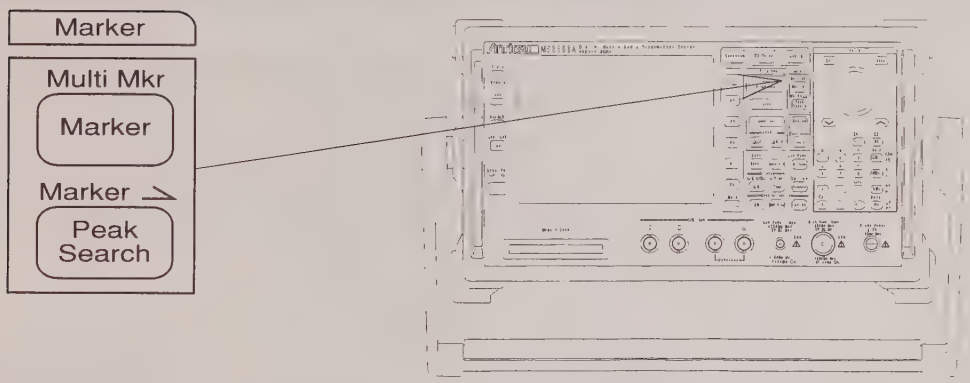
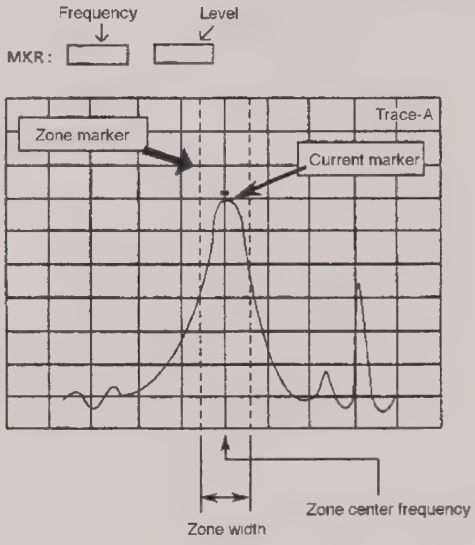
The keys inner section are used as the header keys for setting the marker functions.



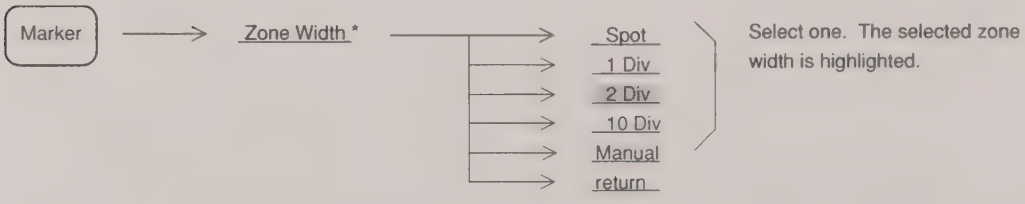
Changing Zone Marker Position and Width

The part enclosed in dotted lines in the center of the screen shown in the figure below is called the zone marker.
The current marker within this zone marker normally moves to the maximum level.
The frequency (or time for time domain mode) and level at the current marker point (intensified point) are displayed at the top left-hand corner of the screen.



Changing Zone Marker Width

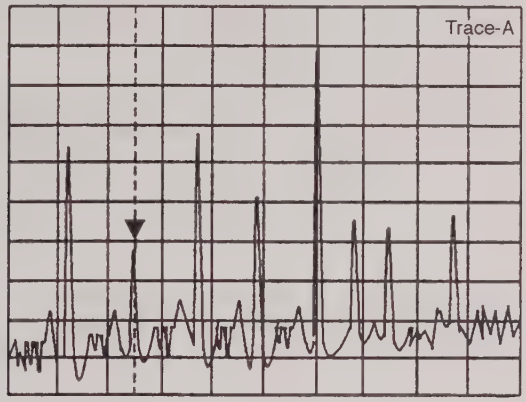
The zone marker width is initially set to 1 division, but can be changed from 1 point to 10 divisions by performing the following key operations.



The zone marker width can be arbitrarily set from 1 point to 10 divisions by rotary knob.
The zone marker width can be arbitrarily set from 1 point to 10 divisions by the corresponding frequency input from the ten keys.

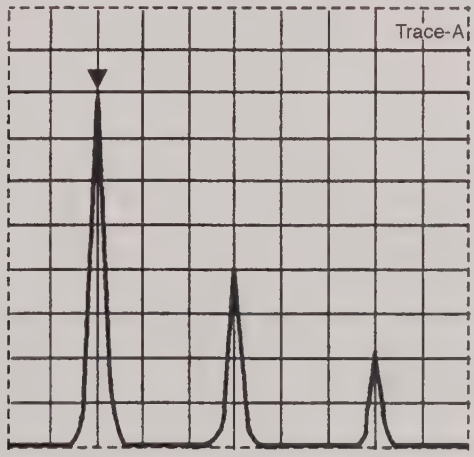
When the zone marker width is set to 1 point (Spot), the zone marker becomes a vertical line. This is called a spot marker. Since the marker center frequency and the current marker frequency coincide, the level at the desired frequency can be measured.

Example of Spot Marker (Zone Width: 1 Point)



If the zone marker is set to 10 divisions when the zone center frequency is at the center of the frequency axis on the screen, the current marker will always move to the maximum peak level over the entire range of the observation frequency.

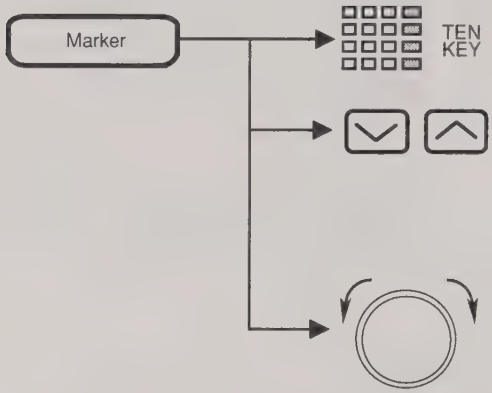
Example of Zone Width: 10 Divisions



Since the zone width in the time domain mode always becomes 1 (Spot), it cannot be changed.

Changing Zone Marker Position

The center frequency (time) of the zone marker is initially centered on the frequency (time) axis on the screen. By performing the following key operations, the zone marker can be moved from the left end to the right end of the frequency axis (time) on the screen.



(Use the ten keys to set the zone marker position as frequency or time.)

(Use the up-down keys to move the zone marker position in 1 division steps.)

In the delta marker mode, setting the zone marker center frequency (time) with the ten keys results in entry of the delta marker value (difference between reference marker and current marker).

Marker Mode

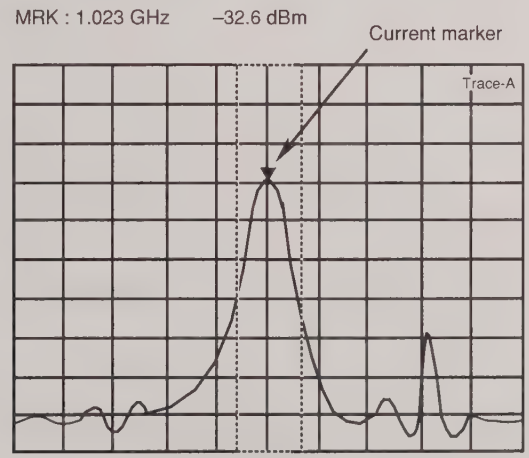
Three types of markers can be used with the spectrum analyzer: normal marker, delta marker, and multimarker.

Normal Marker

A single marker is indicated by ▼ at the maximum level within the zone marker. The frequency and level at that point are displayed digitally.

The normal marker is initially set to ON. When the current state is another marker mode, or when the normal marker is set to OFF, perform the following key operations to set the normal marker to ON.

Marker → Normal Marker



The normal marker displays the absolute level. By setting a display line, the normal marker can also display the level relative to a given level specified as a reference line.

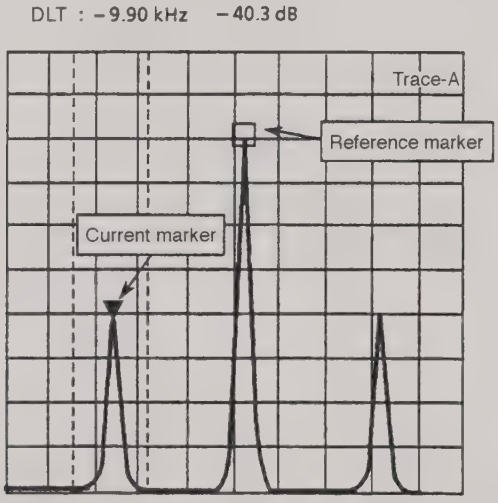
Delta Marker

The current marker position when the delta marker is set to On is fixed as the reference marker (reference point). Then, as the current marker is moved, the reference marker and current marker frequency (time) and level differences are displayed digitally as delta marker values.

In the delta marker mode, the reference marker is indicated by □.

To set the delta marker to On, perform the following key operations.

Marker → Delta Marker



Press the Delta Marker key in the delta maker mode. The reference marker moves to the current marker position and switches to the delta marker mode with that point as the reference point.

Varying the spectrum waveform in the delta marker mode does not change the marker frequency level. The reference marker is not necessarily always on the waveform because it remains unchanged. Also, when the reference marker cannot be positioned on the screen by changing the observation frequency and level and range, it is at the edge of the scale lines.

The marker mode at delta marker-ON becomes the normal mode when the scale mode is changed from log scale to linear scale and vice-versa. If the scale mode was changed, set the delta marker again.

Marker Off

Marker → Marker Off

The marker disappears from the screen. When the Normal Marker key is pressed, the marker is displayed.

Switching Marker Search Mode

Searching the maximum value (Peak) or minimum value (Dip) in the zone marker is selected by pressing this key. Usually select Peak.

Marker → Marker Peak Dip

Display Line

In the state in which a horizontal line which indicates a given level is displayed on the scale, the display line can be used as the frequency response measurement guideline, or as the reference line of the marker level measurement or pass/fail judgement with a standard line.

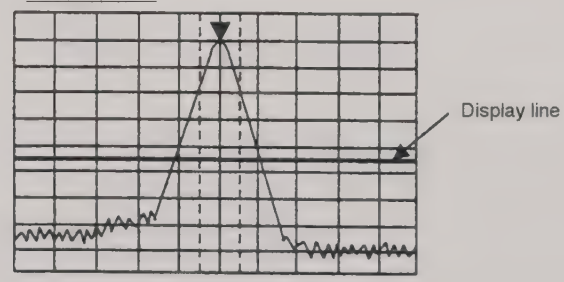
Setting Display Line

To turn the display-line On and Off and to set the display-line level (frequency deviation), perform the following key operations.

Marker → More → Display Line *

(Displays page 2 of the menu.)

- Display Line On Off — Turns the display line On and Off.
- Display Line Level –50.00 dBm — Enters the display line level from the ten keys, etc.
- Marker Level Abs Rel — Selects if the marker level is set by absolute value or relative value (relative to display line).
- Return



Display-line On and Off are common to all traces (A, B, BG, Time). Also, the display-line level is common to all trances (A, B, BG, Time).

The display-line level and Abs/Rel can be selected independently for each trace.

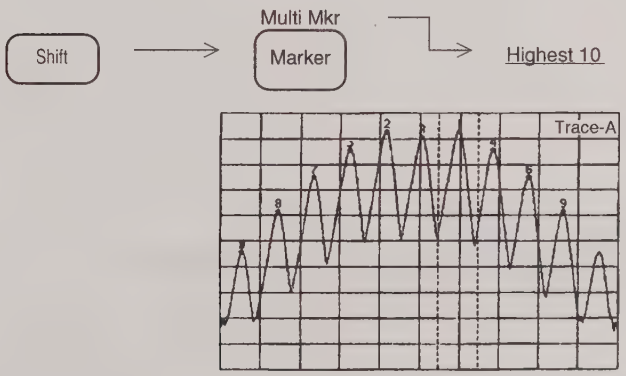
Multi Marker

The spectrum analyzer has a marker function which displays up to ten markers displayed simultaneously. Multimarker can be set by the following four methods:

- Highest 10
- Harmonics
- Peak Hold
- Marker List
- Manual Set

Highest 10 Multimarker

Allocates up to 10 multimarkers in descending order of signal peak level displayed on the screen.



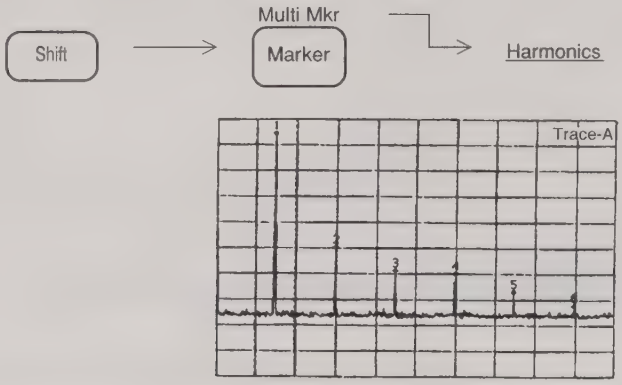
After executing Highest 10, an active marker (with the same functions as the current marker) moves to the peak point of the maximum level signal.

Note:

Each multimarker has a zone as the same as the current marker, and is positioned at the maximum level point. So, when the next sweep is done after Highest 10 operation, each multimarker position may be changed. To prevent this, execute the Highest 10 after stopping the sweeping or after narrowing the zone width.

Harmonics Multimarker

Allocates multimarkers to the 2nd to the 10th harmonic signals of the active marker signal as the fundamental signal.

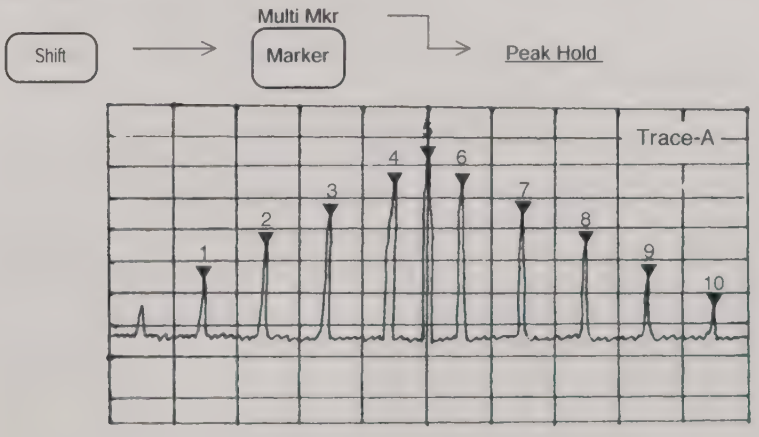


Note:

If the fundamental and second harmonic signals are not separated by more than the marker zone width, or when there are larger level signals other than harmonic signals in the frequency range of the marker zone width centered at the harmonic signals, harmonic signals will be incorrectly detected. In this case, narrow the marker zone width.

Peak Hold Multimarker

Searches the signal peaks displayed on the screen, and then allocates multimarkers to the peaks of the max. Five nearest points to the current marker (as 5th) at the right and left each.



Note:

The multimarker has the zone, the same as the current marker. The multimarker searches the peak points within the zone. So, when the next sweep is performed after a peak hold execution, the new multimarker allocation may be changed. Use the peak hold function after stopping sweep, or with an enough narrow marker zone.

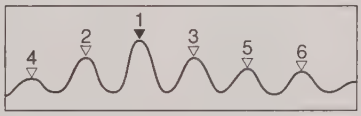
Marker List

Shift → Multi Mkr / Marker → Marker List *

(Display page 2 of the menu by pressing the More key.)

- Marker List On Off — Turns the marker list display On an Off.
- Freq/Time Abs Rel — Selects frequency/time as absolute value or relative value (relative to frequency/time of active marker) display.
- Level Abs Rel — Selects level as absolute value or relative value (relative to acitve-marker level) display.
- Return

In Freq/Time Rel mode, frequency and time of the markers except active marker are displayed in relative values, and "R" marks are appended at the left.
In Level Rel mode, level of the markers except active marker are displayed in relative values,

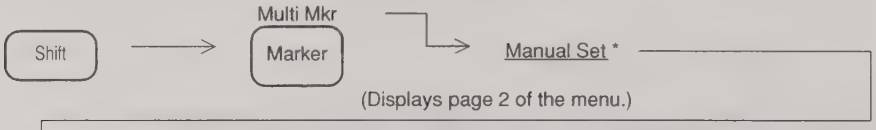


Marker List

*	1:	1.00000GHz	-15.12dBm
	2:R	-1.31MHz	-3.55dB
	3:R	1.41MHz	-3.61dB
	4:R	-2.00MHz	-5.96dB
	5:R	1.89MHz	-6.21dB
	6:R	2.20MHz	-6.76dB
	7:		
	8:		
	9:		
	10:		

Manual Set

Allocates up to 10 multimarkers to arbitrary frequencies or time points.



Change Active Maker No

Selects the active marker from among the markers that are currently On. Each time this key is pressed, the markers are scrolled and selected. #

Select Marker 1

Specifies the marker number to be set to On or Off.

On with Auto Select

At the same time the marker number selected above is set to On, the selected marker is made the active marker. If the selected marker is already On, the next higher marker number of the markers set to Off is set to On. By holding this key down, the multimarkers are set to On one by one in ascending order of number.

<Example> When marker No.4 is selected when marker No. 3, 4, 5, 8, and 9 are On, the markers are turned On in No., 6, 7, 10, 1, 2 order.

Off with Auto Select

Sets the marker of the selected No. to Off. If the selected marker is already Off, the next smaller marker No. of the markers set to On is set to Off. By holding down this key, the multimarkers are set to Off one by one in descending order of number. When the active marker is set to Off, the marker with the next smaller number is made the active marker.

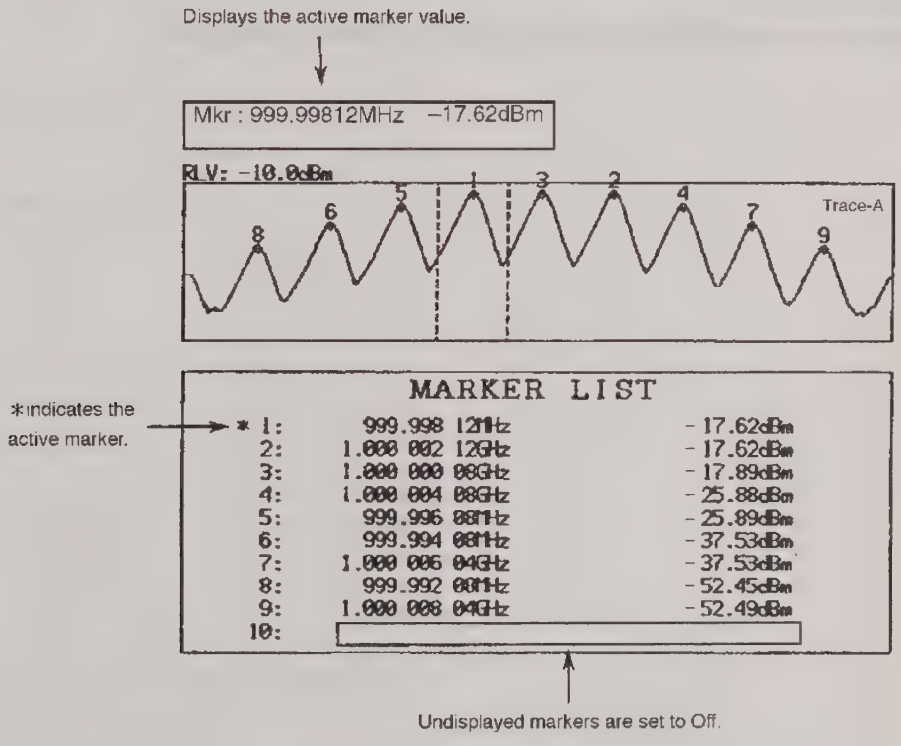
<Example> When marker No. 7 is selected to be set to Off when marker No. 3, 4, 5, 8 and 9 are On and marker No. 5 is made the active marker, the markers are set to Off in No. 6, 5, 4, 3, 9 order, then marker No. 8 becomes the active marker.

The active marker is indicated by the ▼ mark. The other marker numbers are indicated by the ▽ mark. The active marker can be moved by using the ten keys, up-down keys, or rotary knob.

Continued

Clear All — Leaves only the marker number currently made the active marker and sets all the other multimarkers to Off. The active marker number is then reset to 1.

return



Multimarker Off

To return from multimarker to normal marker, perform the following key operations.

Shift → Multi Mkr Marker → Multi Marker On Off

Marker Search

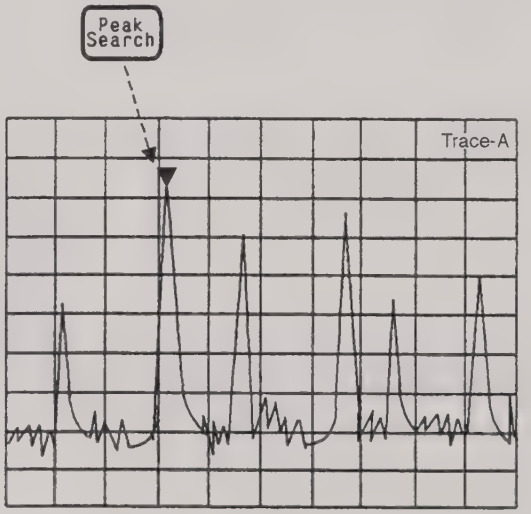
The spectrum analyzer has the following four marker search functions:

- Peak search
- Next Peak search
- Dip search
- Next Dip search

Peak Search

Peak Search detects the maximum level point from the entire trace in which a marker is displayed and moves the marker to that point.

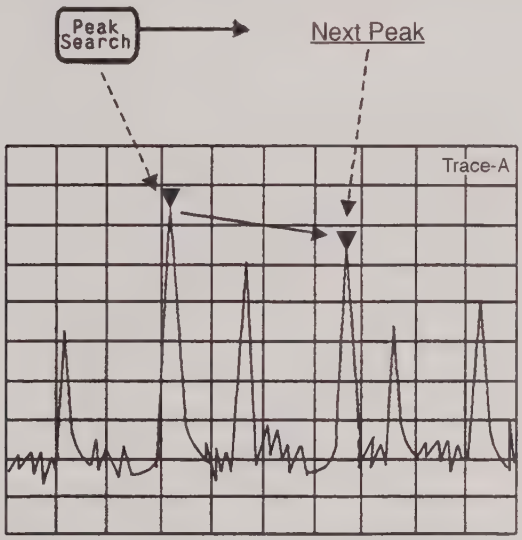
To Execute Peak search, perform the following key operations.



Next Peak Search

Next Peak Search detects the next largest peak relative to the current marker level and moves the marker to that point. (When there are two or more peaks with the same level on the screen, the leftmost peak is detected.)

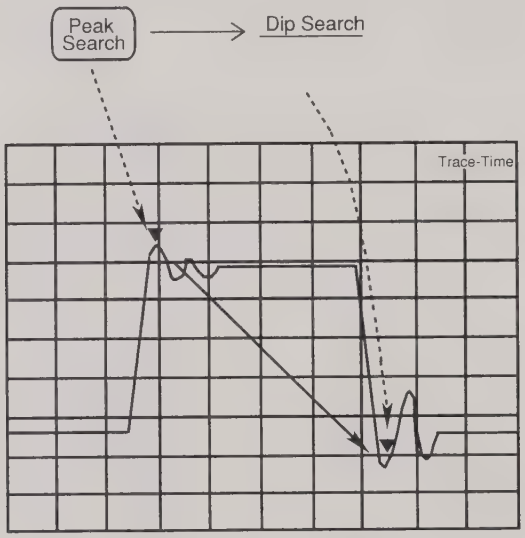
Execute Next Peak search by performing the following key operations.



The next largest peaks can be detected and the marker can be moved to those peaks by executing Next Peak Search consecutively.

Dip Search

Dip search detects the minimum level point from the entire trace in which a marker is displayed and moves the marker to that point.
Execute Dip search by the performing the following key operations.

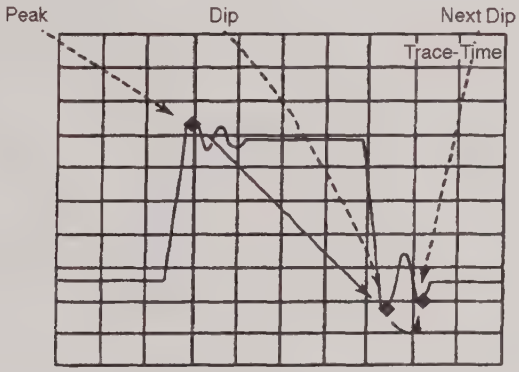


Time domain waveform

Next Dip Search

Next Dip Search detects the next smallest dip relative to the current marker level and moves the marker to that point. (When there are two or more dips with the same level on the screen, the leftmost dip is detected.)
Execute Next Dip Search by performing the following key operations.

Peak Search → Next Dip



Time domain waveform

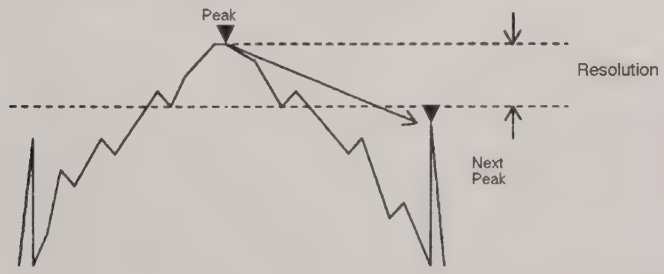
The next smallest peaks can be detected one by one and the marker moved to the detected peaks by executing Next Dip Search consecutively.

Setting Search Resolution

Sets the Peak and Dip search resolution. When searching for the next peak, etc., the marker moves to the point of the set resolution or higher.

Peak Search → Resolution 1.23 dB

→ Enter the resolution in dB units from the ten keys.

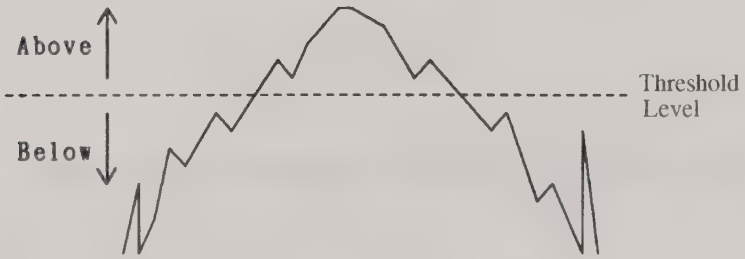


Setting Search Threshold

Sets the display line to the threshold and searches for the level above or below the display line.

Peak Search → Threshold *

- Treshold On Off — Turn threshold On and Off by pressing this key.
- Search Above Below — Select search above or below the display line by pressing this key.
- Threshold Level –50.00 dBm — Sets the display line level.
- Return



Setting Parameters Using Marker Values

The marker value can be set as the parameter value of the observation frequency, reference level, and so on. This facilitates observation of the desired waveform.

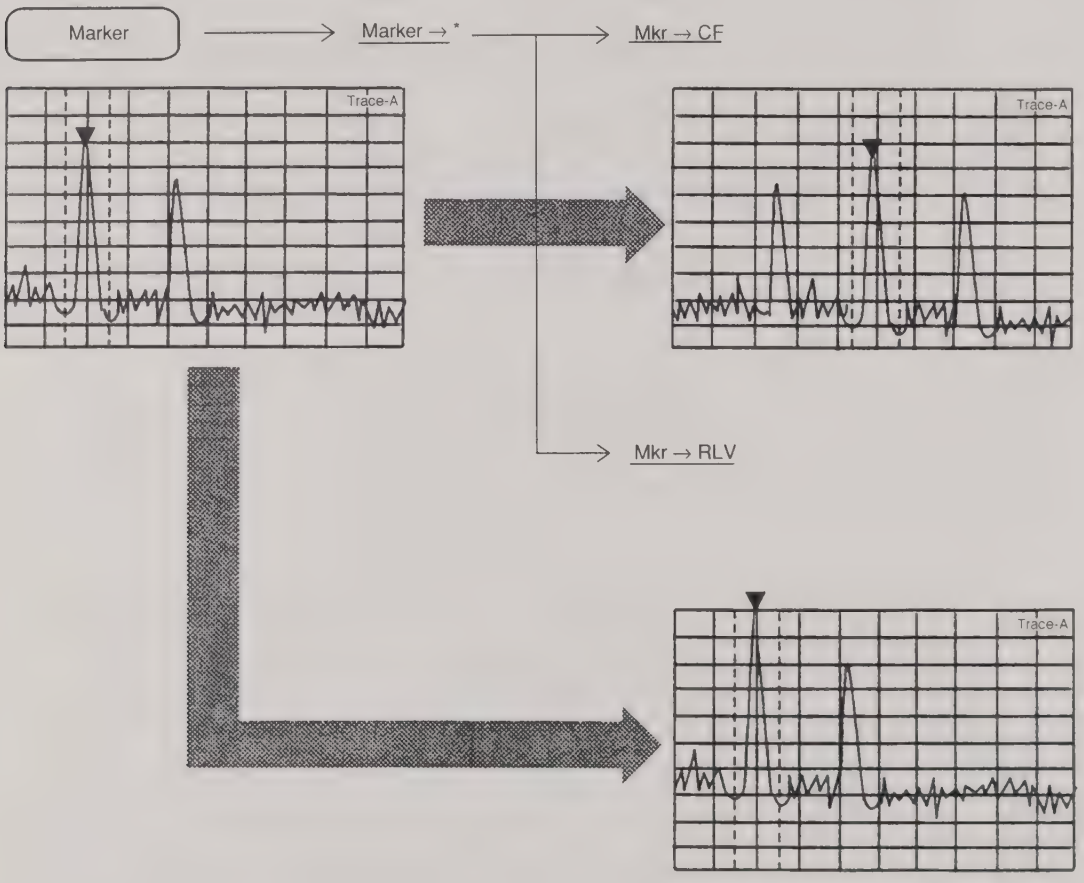
To set parameters using the marker value, the following settings are possible:

- Mkr → CF — Sets the marker frequency to the center frequency.
- Mkr → RLV — Sets the marker level to the reference level.
- Mkr → CF Step Size — Sets the marker frequency to the center frequency step size.
- Delta Mkr → Span — Sets the reference marker and current marker frequency to the start frequency and stop frequency, respectively.
- Zone → Span — Sets the zone marker center frequency and zone width to the center frequency and frequency span, respectively.

In the time domain mode, only Mkr → RLV is valid.

Mkr → CF/Mkr → RLV

Sets the current marker frequency or level to the center frequency or reference level.

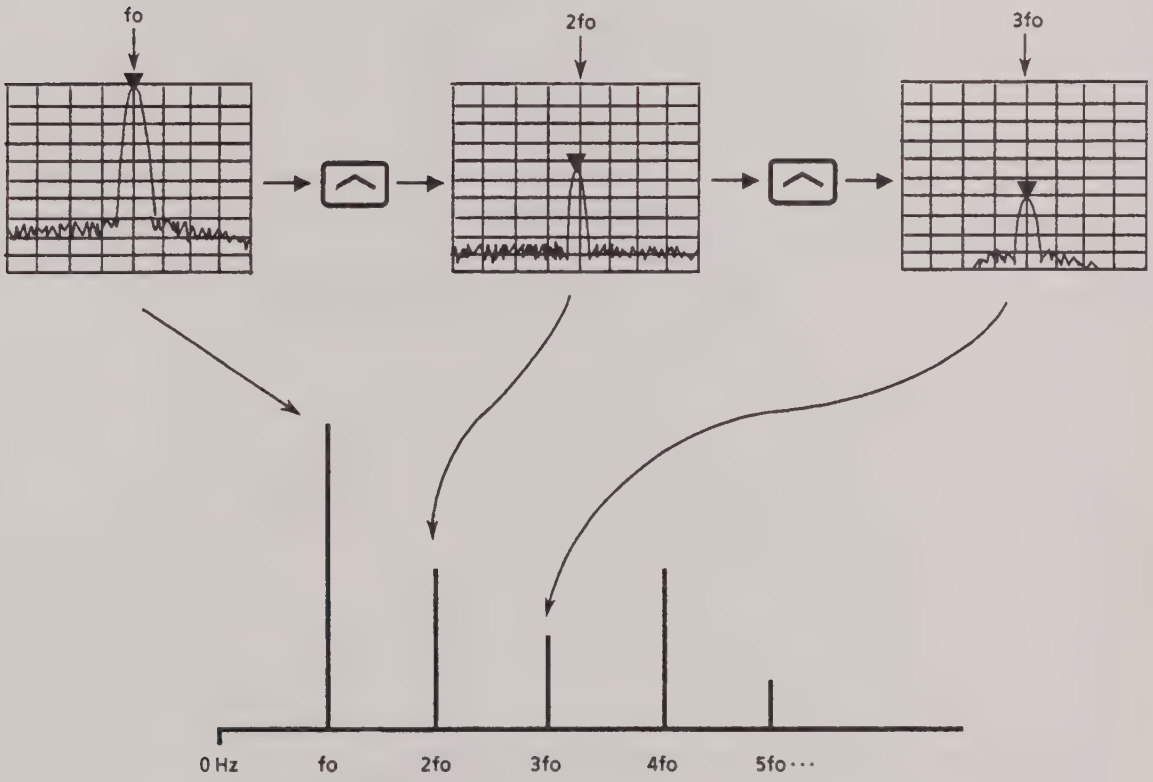


Mkr → CF Step Size

Sets the marker frequency to the center frequency step size (up-down keys resolution).

Marker → Marker → * → Mkr → CF Step Size

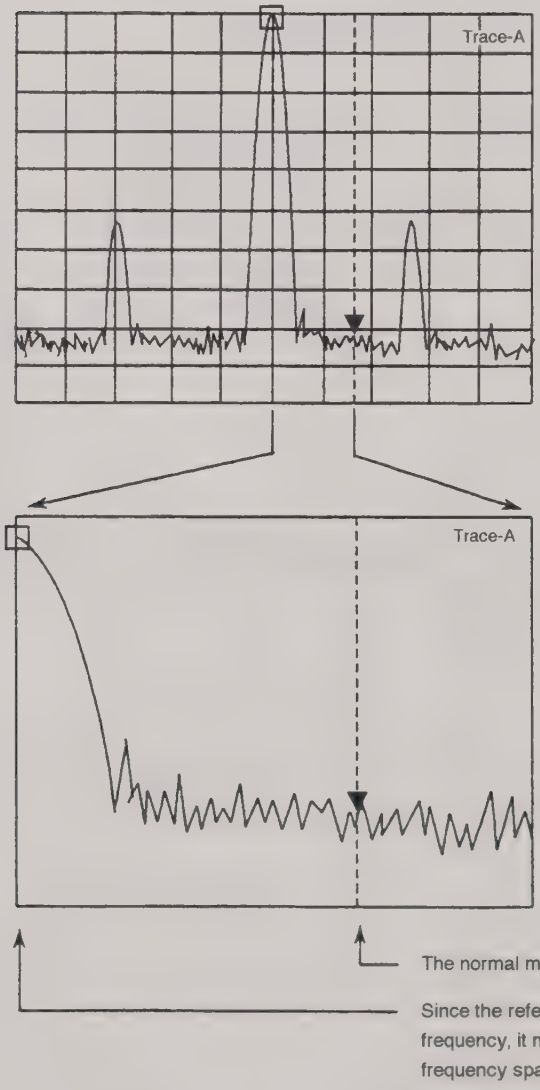
Although this action does not cause any change to appear on the screen, when the center frequency is changed with the up-down keys, the center frequency is changed with the marker frequency as the step size. This facilitates observation of harmonic waves.



Delta Mkr → Span

In the delta marker mode, this operation sets the delta marker mode current marker frequency and reference marker frequency to the start frequency and stop frequency, respectively.

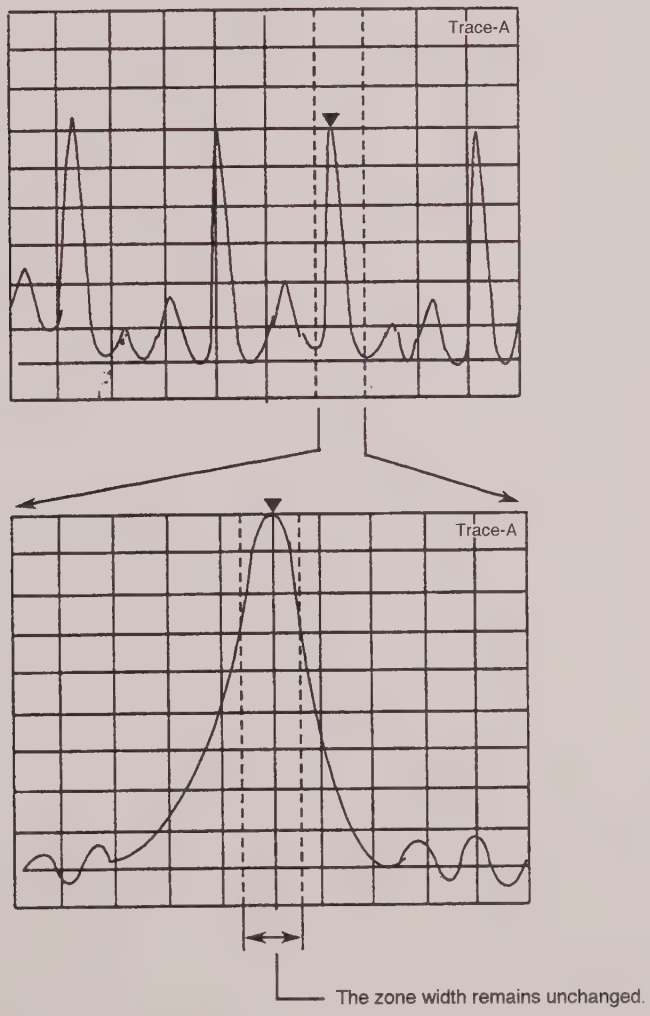
Marker → Marker → * → Delta Mkr → Span


Trace-A
Trace-A
The normal marker position remains unchanged.
Since the reference marker is fixed relative to the frequency, it moves to the extreme left when the frequency span is changed.

Zone → Span

To set the zone marker center frequency and width to the center frequency and frequency span, respectively, perform the following key operations.

Marker ⟶ Marker → * ⟶ Zone → Span



Section 4 Signal Search Function

Signal search facilitates extraction of the objective signal Although the functions of signal search are similar to the marker function, this section only describes the Signal Search section

Detecting Peaks 4-3
Detecting the Maximum Peak Signal by Automatic Tuning 4-4
Moving the Measurement Point 4-5
Peak → CF and Peak → RLV 4-6

Detecting Peaks

The spectrum analyzer has the following three peak detection functions:

- Auto Tune
- Zone Marker
- Marker Tracking

Section 3 "Marker Function" describes the Zone Marker function and Section 6 "Selecting the Sweep Method" describes the Marker Tracking function.

Detecting the Maximum Peak Signal by Automatic Tuning

Frequency ——→ Auto Tune

Pressing the Auto Tune key detects the maximum peak signal within the Back Ground (BG) and sets that signal frequency and level to the center frequency and reference level, respectively.

Notes:

- When executed at a frequency span of more than 100 MHz, the frequency span is set to 100 MHz. When executed at a frequency span of less than 100 MHz, that value is retained.
- The input attenuator is set to Auto.
- In the initial state, the Auto Tune frequency range is set to 250 MHz to 7.8 GHz/13.2 GHz. By changing the trace BG frequency range, the Auto Tune frequency range can also be set as follows:

  Start frequency

  Start frequency specified in trace BG
  However, except the 0 Hz to 3/100 frequency span range.

  Stop frequency

  Stop frequency specified in trace BG.

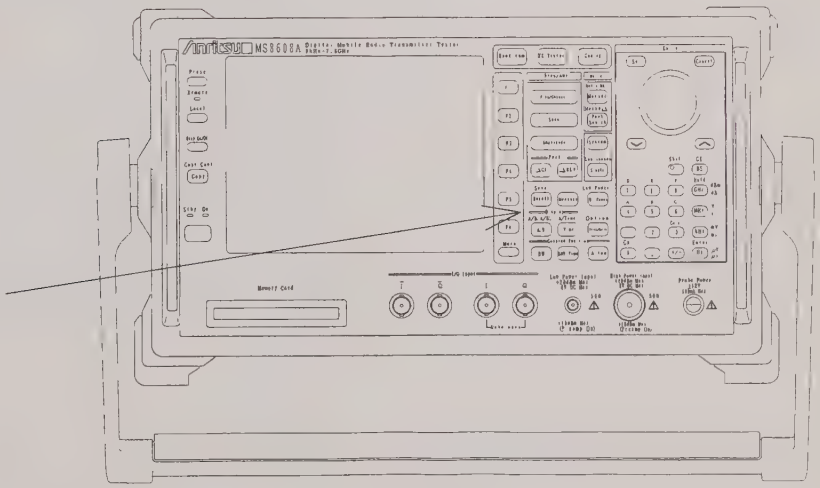
Moving the Measurement Point

This function moves the spectrum on the screen to the center to facilitate measurement. The following five functions can be used.

- Mkr → CF — Sets the marker frequency to the center frequency.
- Mkr → RLV — Sets the marker level to the reference level.
- Peak → CF — Sets the frequency of the maximum point on the screen to the center frequency.
- Peak → RLV — Sets the level of the maximum level point on the screen to the reference level.
- Scroll→, ←Scroll — Scroll the observation frequency.

Section 3 "Maker Function" describes the Mkr → CF and Mkr → RLV functions. Section 2 "Frequency/Amplitude Data Entry" describes the scroll function.

This section describes the Peak → CF and Peak → RLV functions.

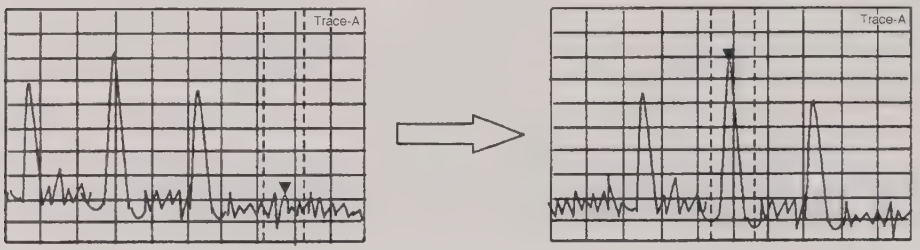


Peak → CF and Peak → RLV

The Peak → CF and Peak → RLV functions set the maximum level value displayed on the screen to the center frequency and reference level, respectively, and move the peak point to the center of the frequency axis on the screen and to the top level axis, respectively.

(1) Peak→ CF

[⩘CF] Sets the maximum peak point and the zone marker to the center frequency.

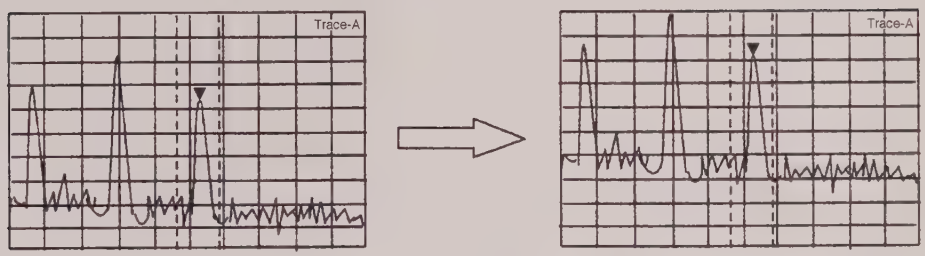


Notes:

- When the frequency at the maximum peak point is less than 0 Hz, the center frequency is set to 0 Hz.
- If there are two or more maximum peak points with the same level on the screen, the peak point with the lowest frequency is moved to the center frequency.
- Peak → CF does not operate in the following cases:
  - [1] When zone sweep is On
  - [2] In the time domain mode
  - [3] When A<Time is specified in the A/Time mode

(2) Peak → RLV

Sets the maximum peak level to the reference level.



Note:

- If the level at the peak point exceeds the permitted range for the reference level, the reference level is set to the maximum (minimum) reference level that can be set.
- If the level at the peak point exceeds the reference level (scale over), one operation of the Peak→RLV may not be able to set the correct reference level. In this case, repeat the Peak→RLV operations a few times.

Section 5 Selecting the Display Method

This sections gives a detailed description of the display modes (Trace A/B, A/B, A/BG, Trace Time, A/Time), storage modes (Normal, Max Hold, Min Hold, Average, View, Cumulative, Overwrite), detection modes (Normal, Pos Peak, Sample, Neg Peak, Aberage) and time domain analysis.

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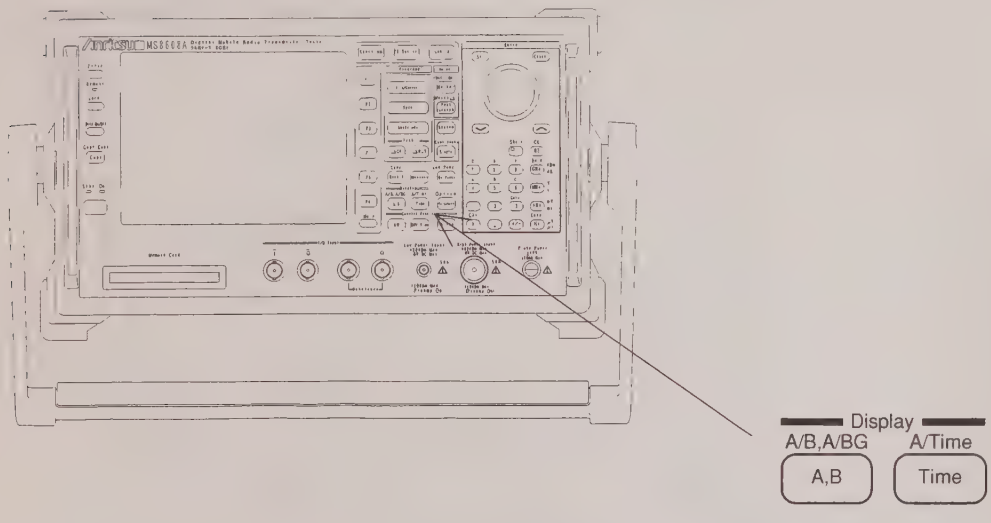
The spectrum analyzer can display four trace modes (BG †, A, B, Time) in six Display modes (A, B, Time, A/B, A/BG, A/Time).
In the Display mode, the two keys of the Display section shown below are used.

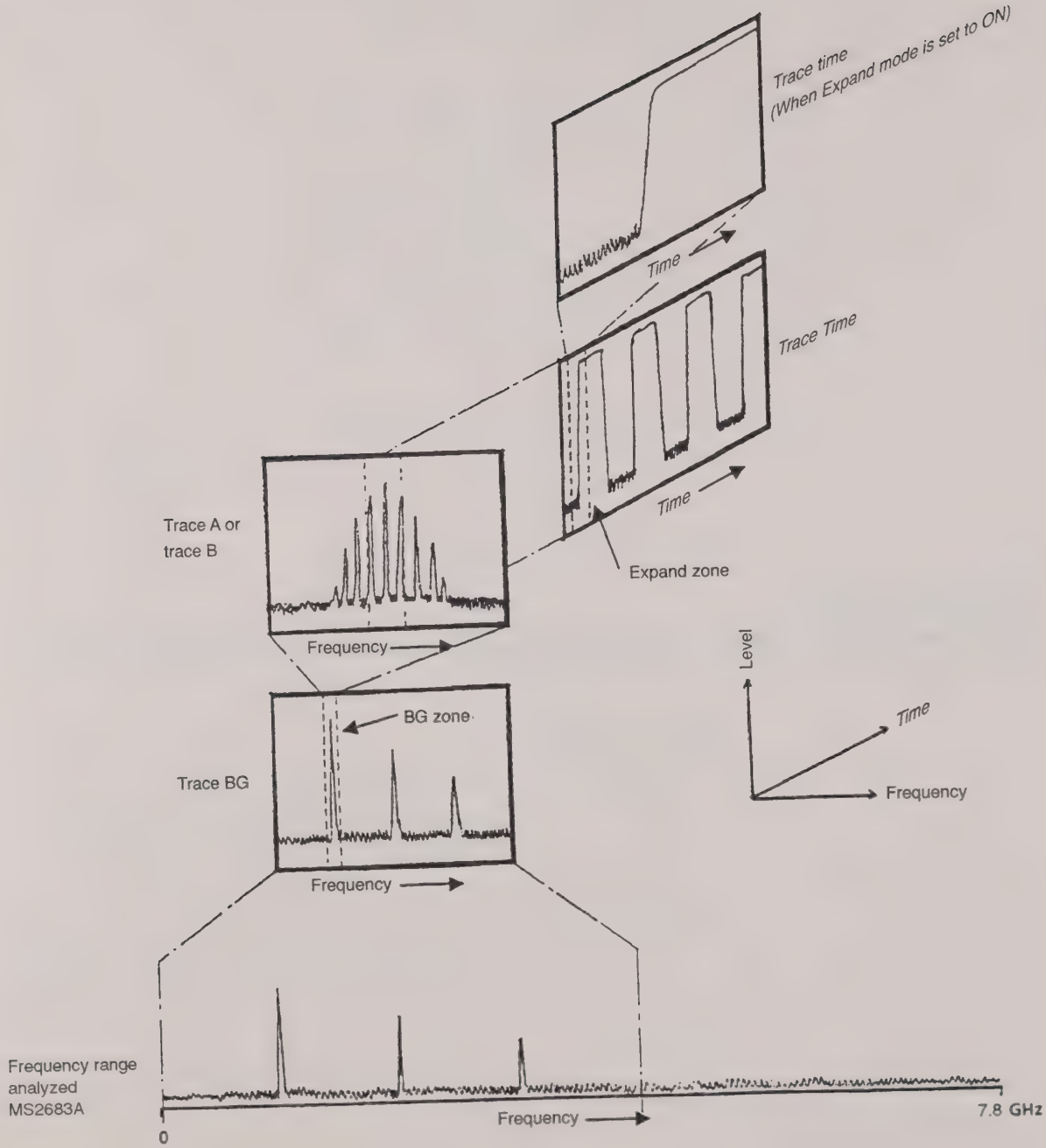


Display Mode

The following outlines the trace modes. The figure on the next pages shows the correlation between trace modes.

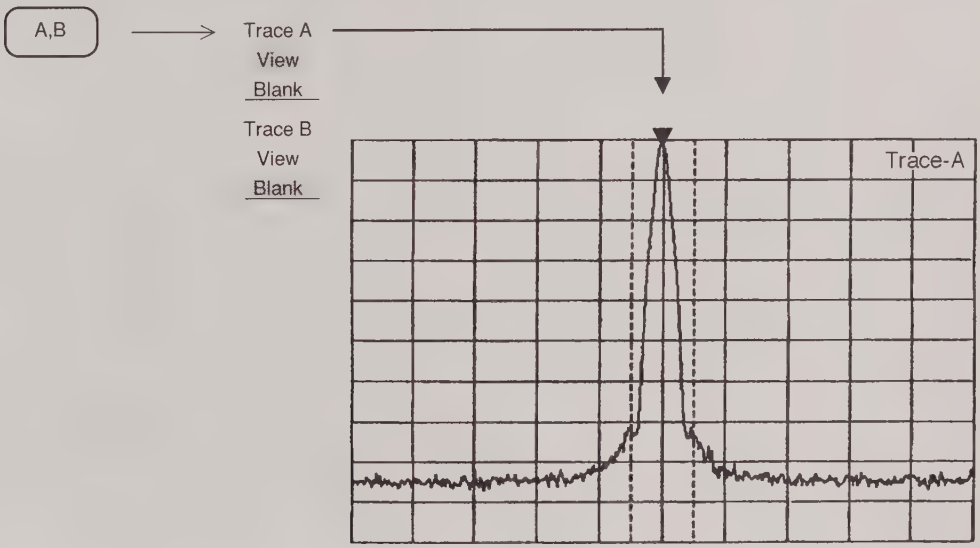
- Trace BG ..... When the objective signal is measured in the trace A, B, or Time mode, the trace BG mode allows the frequency range to be observed to be pre-set to a wide band. The BG band is initially set to full span (0 to 7.8 GHz/13.2 GHz).
- Trace A, trace B ..... Used to analyze signals in the normal frequency domain. The BG zone within trace BG is expanded and displayed. Different frequency range can be observed by Trace A and Trace B.
- Trace Time ..... Displays the time axis waveform at the center frequency of trace A.

† BG (Back Ground)


Trace time
(When Expand mode is set to ON)
Time
Trace Time
Time
Trace A or
trace B
Expand zone
Frequency
Level
Time
Frequency
BG zone
Trace BG
Frequency
Frequency range
analyzed
MS2683A
Frequency
0
7.8 GHz

Trace A

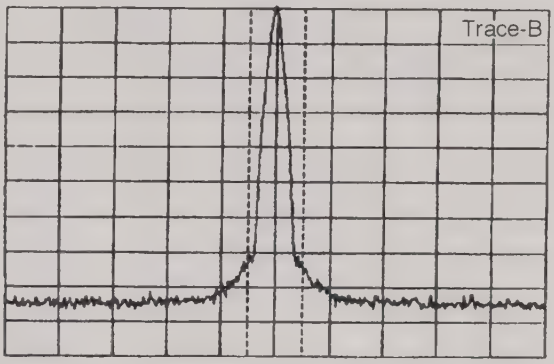
Trace A is used to analyze signals in the normal frequency domain.



Trace B

Like trace A, trace B is used to analyze signals in the normal frequency domain. When used with trace A, it is possible to compare waveform A and waveform B.

A,B → Trace A
View
Blank
Trace B
View
Blank



Parameters of the trace A and trace B can be set independently.

Moving the Trace

This function moves and adds the trace A and trace B displays once.

A, B → Trace Move *
(Displays page 2 of menu)

- A→B — Moves trace A to trace B and displays it.
- B→A — Moves trace B to trace A and displays it.
- A↔B — Swaps and displays trace A and trace B.
- A+B→A — Adds trace A and trace B and displays the result at trace A.
- Return

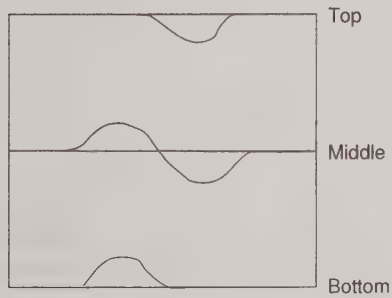
Set the move-destination-trace storage mode to View, and stop the sweeping before moving the trace.
If the trace A or trace B threshold is set to any other mode, the trace data will be displayed once, then updated.

Trace Computation

This function continuously displays the difference between trace A and trace B. Normally set trace B to the View mode before executing this function.

A, B → Move → Trace Calculate *

- Normalize (A–B+DL) On Off — Turns the mode that subtracts trace B from trace A and adds the display line value and continuously displays it at trace A On and Off.
- A–B→A On Off — Turns the mode that subtracts trace B from trace A and continuously displays it at trace A On and Off.
- Ref Line * — Selects if the A–B computed value=0 line is to be displayed at the top, middle, or bottom of the screen.
- Return

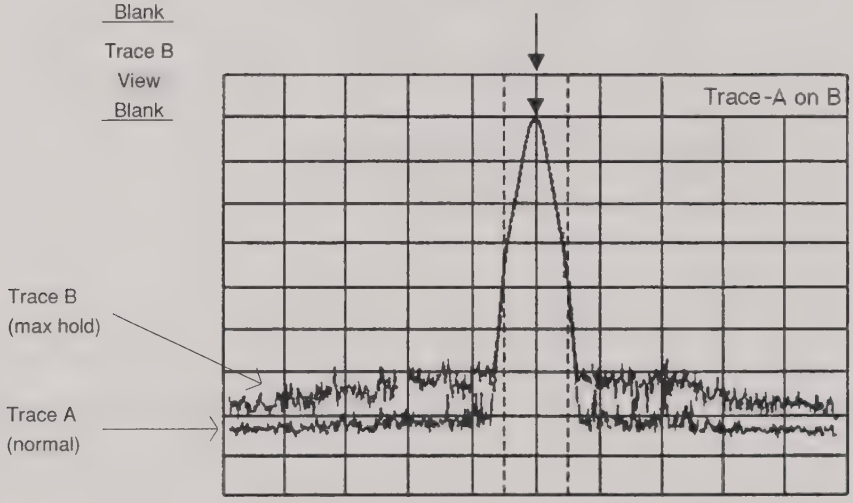


Trace A and Trace B Overwrite Display

Overwrites trace A and trace B on one screen. At this time, the trace B frequency range, reference level, and other parameters are the same as trace A.
However, in the threshold mode and detection mode, the parameters can be set independently at trace A and trace B. For instance, comparison measurement with a standard waveform and simultaneous
observation of the same waveform in a mode different from the normal mode and max hold (or averaging, etc.) mode are possible.

A,B → Trace A View Blank
Trace B View Blank

Pressing key to Trace B View Blank, Trace B is displayed.
Trace A is also the same.



Setting Active Trace

When trace A and trace B were overwritten on the same screen, select the marker trace by pressing this key.

A, B → Active Trace A B

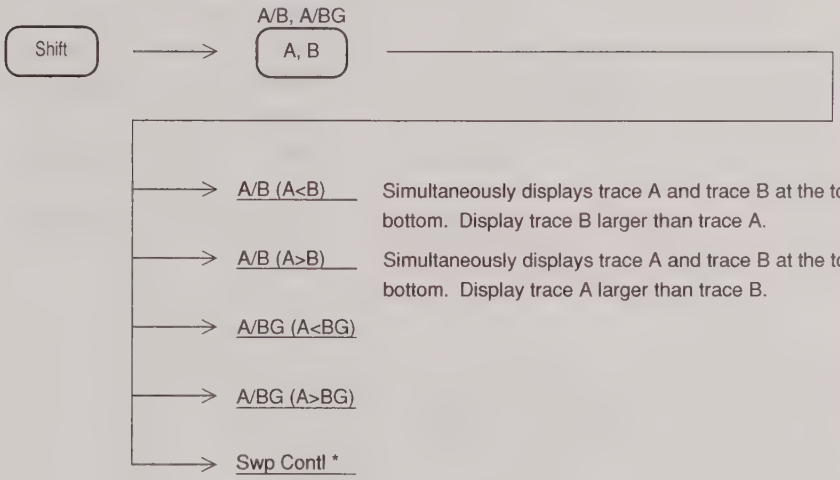
When Trace A on B, this function key is displayed.

Trace A/Trace B Top and Bottom Split Display

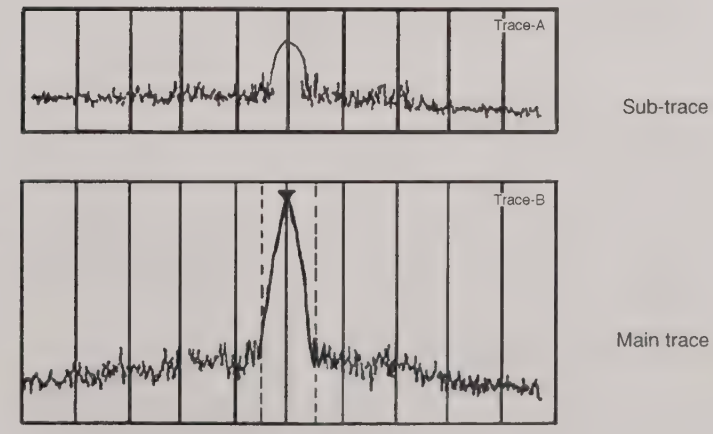
When trace A and trace B are overwritten and displayed, the setup parameters are common. In this mode, however, the frequency, and other parameters can be set independently.

For instance, the reference wave can be observed at trace A and harmonics can be simultaneously observed at trace B.

When examining interference, the frequency that is the source of the interference and interference of a different frequency that is generated by the effect of the source frequency can be simultaneously observed.



- The large display is called the main trace and the small display is called the sub-trace.

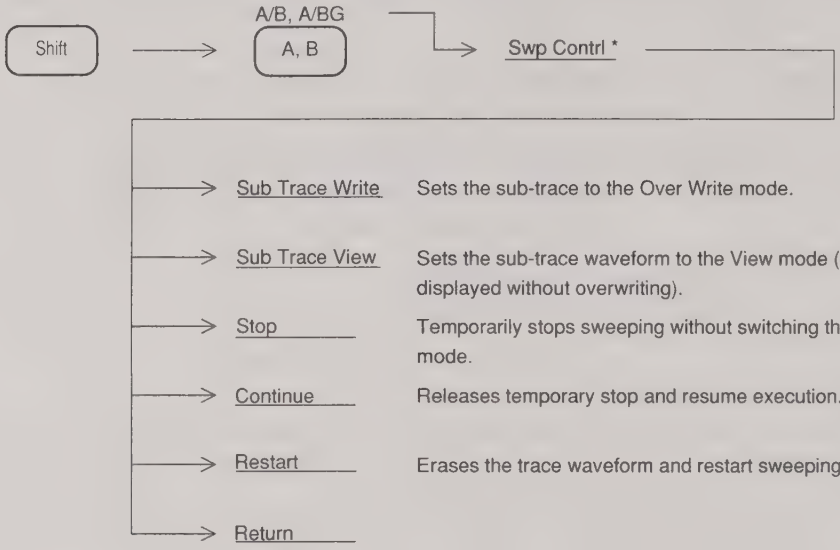


Trace A and trace B are displayed at the top and bottom, respectively.

For A/B (A<B)

Setting Sub-trace Sweep

To set the sub-trace storage mode, perform the following key operations.



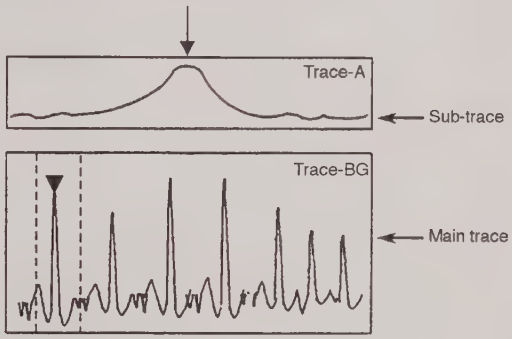
Trace A/Trace BG Top and Bottom Split Display

This mode simultaneously displays trace A and trace BG. It is used to extract a specific signal from a wide frequency range.
The conditions over a wide surrounding frequency range can be monitored while simultaneously observing the selected signal in detail.

Shift → A/B, A/BG → A, B

→ A/B (A<B)
→ A/B (A>B)
→ A/BG (A<BG)

Simultaneously displays trace A and trace BG at the top and bottom. Displays trace BG larger than trace A.

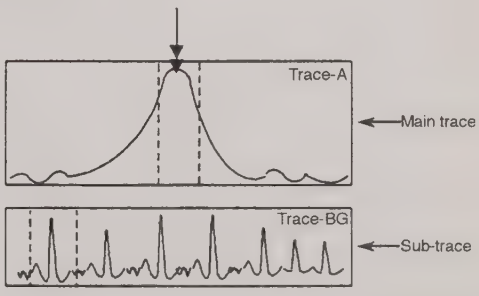


In this mode, the frequency range of trace A can be specified by moving a marker (BG zone marker) on the BG main trace.

→ A/BG (A>BG)

Simultaneously displays trace A and trace B at the top and bottom. Displays trace A larger than trace BG.

→ Swp Cont! *

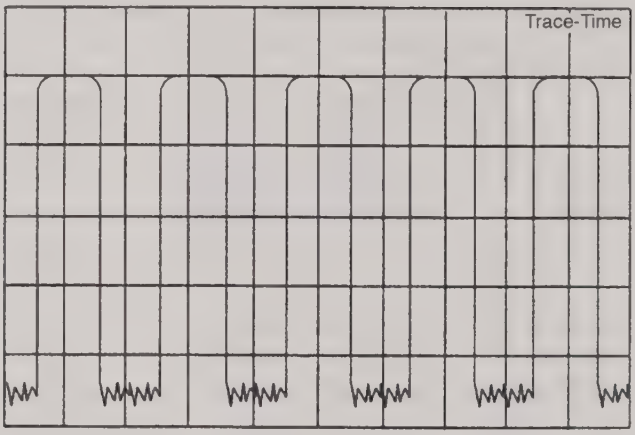


In this mode, the frequency range of trace A can be directly set while checking the trace A position (BG zone marker position) within BG.

Trace A and trace BG parameters other than reference level, vertical axis scale, and input attenuator settings are used independently. Each parameter can be set in the main trace (larger displayed side).
Marker operation is available only for the main trace.

Trace Time

Trace Time displays the time axis waveform at the center frequency of trace A or trace B. To display trace Time, press the [Time] key.



[Time]

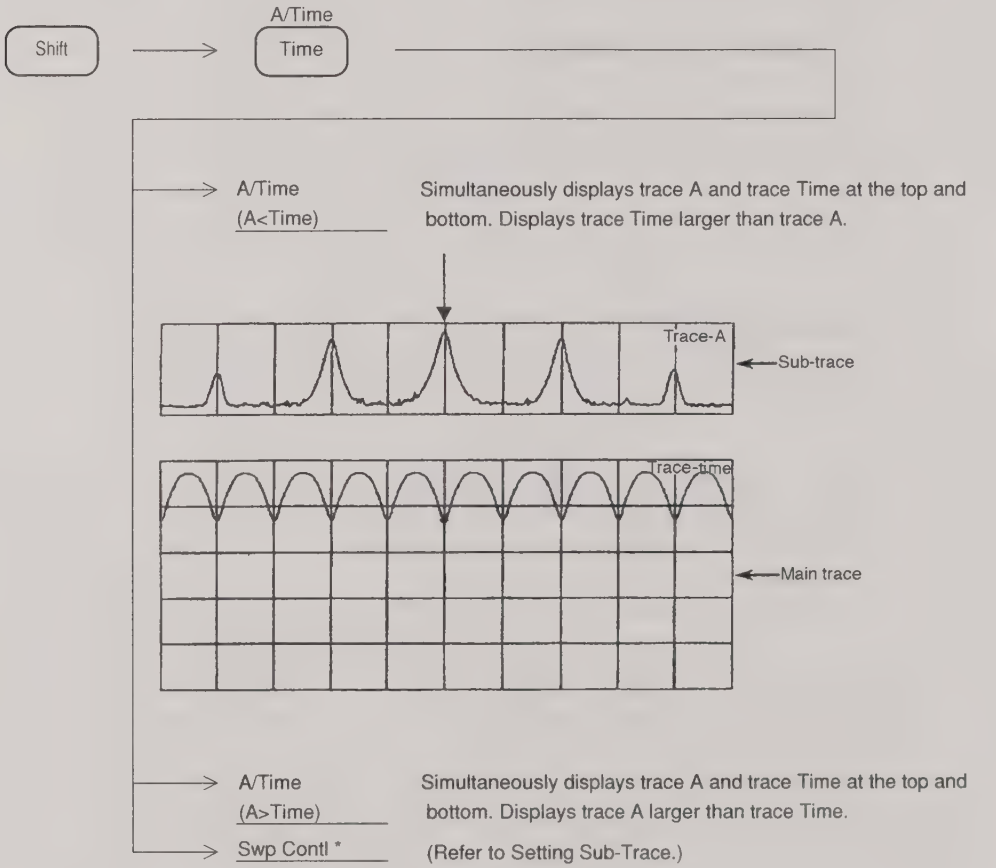
- Delay Time 10.0 ms — Sets the delay time from trigger to sweep. When a negative value is input, the waveform before the trigger is displayed up to one screen. (See paragraph 6.10 of CHAPTER 6.)
- Time Span 200 us — Sets the time span (time domain sweep time).
- Expand* — Expands and display part of the time domain waveform.
- Storage * — Selects the storage display mode.
- Detection * — Selects the detection mode.

Trace-A center frequency and Trace-Time tuning frequency is always common. Other parameters can be set independently. However, the following parameters can be used commonly by "Coupled function common/independent setting mode" of Section 7.

- Resolution bandwidth (RBW)
- Video bandwidth (VBW)
- Sweep time (Sweep Time/Time Span)

Trace A/Trace Time Top and Bottom Split Display

Trace A/Trace Time top and bottom split display simultaneously displays trace A and trace Time.

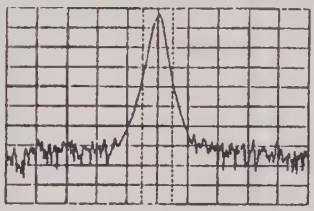
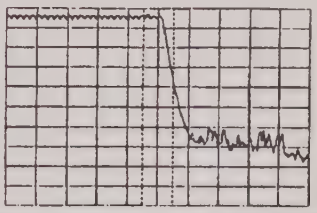
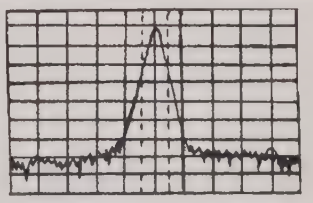
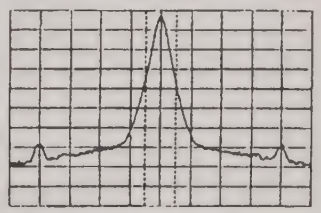
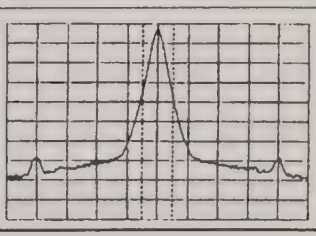


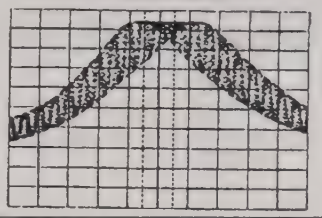
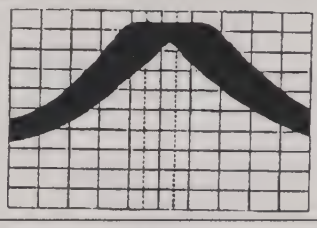
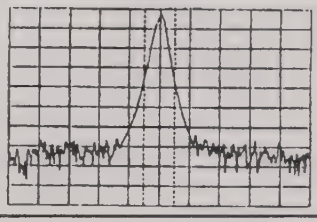
Each parameter can be set in the main trace (larger displayed trace). However, for common parameters (center frequency, reference level, input attenuator, and when system setting is coupled mode resolution bandwidth, video bandwidth, etc.), the sub-trace parameters can also be changed even when setting is performed at the main trace. Marker operation is only available for the main trace.

Storage Mode

The following seven storage modes can be selected for Display modes trace A, trace B, and trace Time.

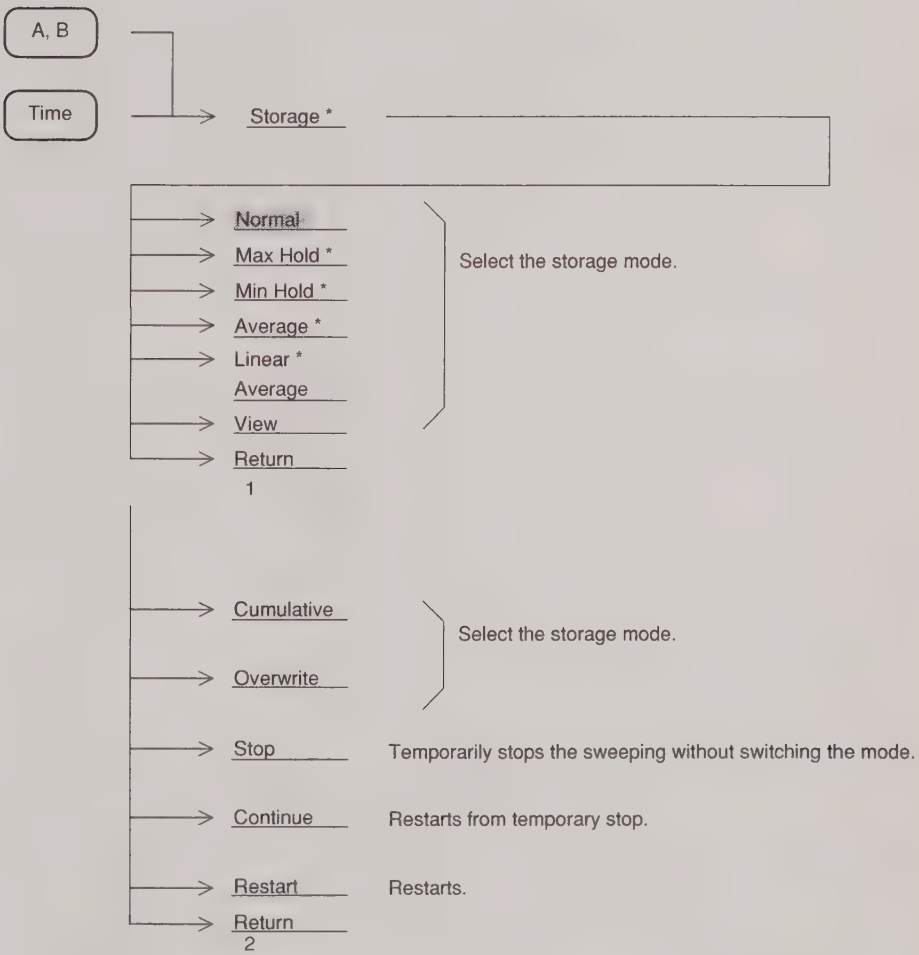
Types of Trace Modes (1/2)

NO.	Mode	Explanation	Display example
1	Normal	Refreshes and displays the trace data at each sweep. This is used for normal measurement.	
2	Max Hold	At each sweep, compares the new trace data with the old data at each X axis point, then displays the larger value data. It is used to record a frequency-drifting signal.	
3	Min Hold	At each sweep, compares the new trace data with the old data at each X axis point, then displays the smaller value data.	
4	Average	At each sweep, calculates the average data at each X axis point, then displays the averaged results. This mode is used to improve the S/N ratio. For further details on the averaging function, refer to page 5-18.	
5	Linear Average	In the log display mode, equalization processing in linear value is performed and a result is displayed by the log. It is effective in signal measurement of the letter of a burst.	

NO.	Mode	Explanation	Display example
6	Cumulative	Displays the cumulative waveform at each sweep. The waveform data, which are not connected by lines, are displayed by plotting the data.	
7	Over write	Displays the waveform overwritten without deleting the old trace data.	
8	View	Continues displaying the waveform as it is, without refreshing the currently-displayed trace data. This mode is used to observe waveforms with the trace data stopped temporarily.	

Setting Storage Mode

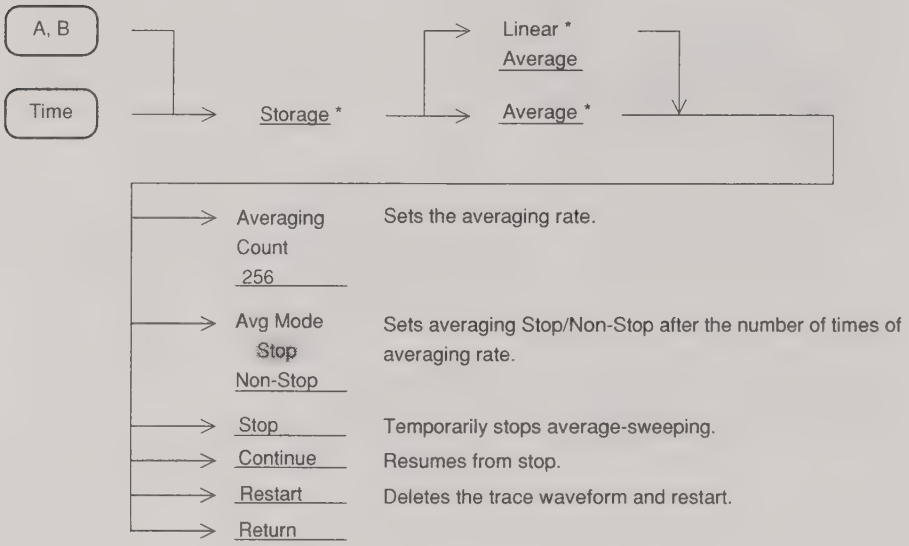
The storage mode can be selected by operating the function keys shown below while the spectrum analyzer is operating in the trace A, trace B, or trace Time mode.



(Display page 2 of the menu by pressing the More key.)

Averaging Function

The digital averaging function calculates the average data at each X axis point at each sweep and displays the results. It is executed by selecting Average in the trace A, trace B, and trace Time display modes.



The averaging function improves the S/N ratio depending on the averaging rate and the number of sweep repetitions as shown on the next page.
Digital video averaging is performed by the method shown below.

Averaging Rate = N

[3] Restart

[1] Stop

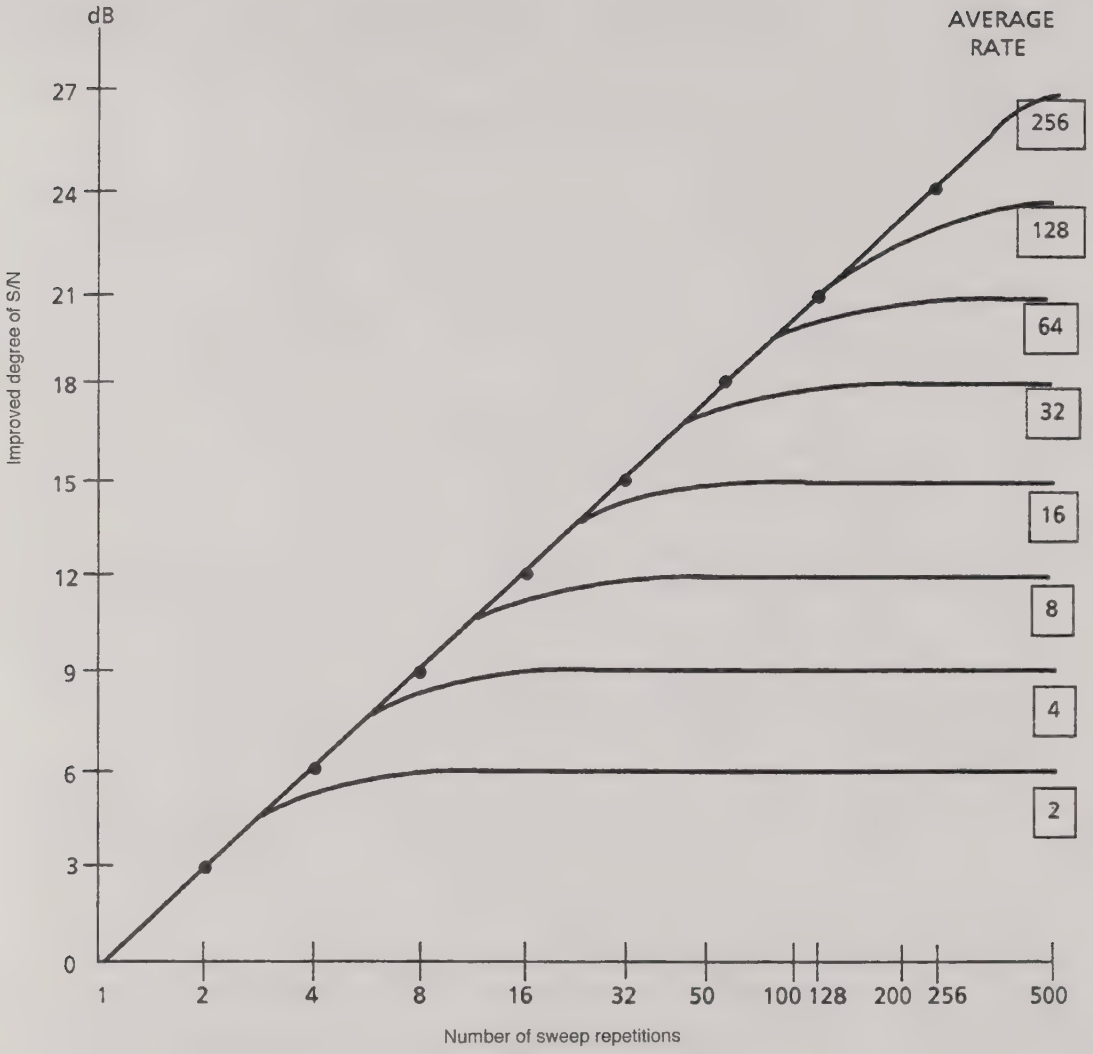
[2] Continue

Number of sweep repetitions	Measurement value	Displayed value
1	$M(1)$	$Y(1)=M(1)$
2	$M(2)$	$Y(2)=Y(1)+\frac{M(2)-Y(1)}{2}$
3	$M(3)$	$Y(3)=Y(2)+\frac{M(3)-Y(2)}{3}$
⋮	⋮	⋮
N–1	$M(N-1)$	$Y(N-1)=Y(N-2)+\frac{M(N-1)-Y(N-2)}{N-1}$
N	$M(N)$	$Y(N)=Y(N-1)+\frac{M(N)-Y(N-1)}{N}$
N + 1	$M(N+1)$	$Y(N+1)=Y(N)+\frac{M(N+1)-Y(N)}{N}$
N + 2	$M(N+2)$	$Y(N+2)=Y(N+1)+\frac{M(N+2)-Y(N+1)}{N}$
⋮	⋮	⋮

[1] Sweep stops after N repetitions. (When Avg Mode is Stop)

[2] The above stop condition is released by restarting sweep by Continue. The averaging operation resumes, while counting the number of sweep repetitions as N+1, N+2....

[3] When Restart is performed during sweep or Stop, averaging is repeated from sweep count 1.



S/N Improvement by Digital Video Averaging

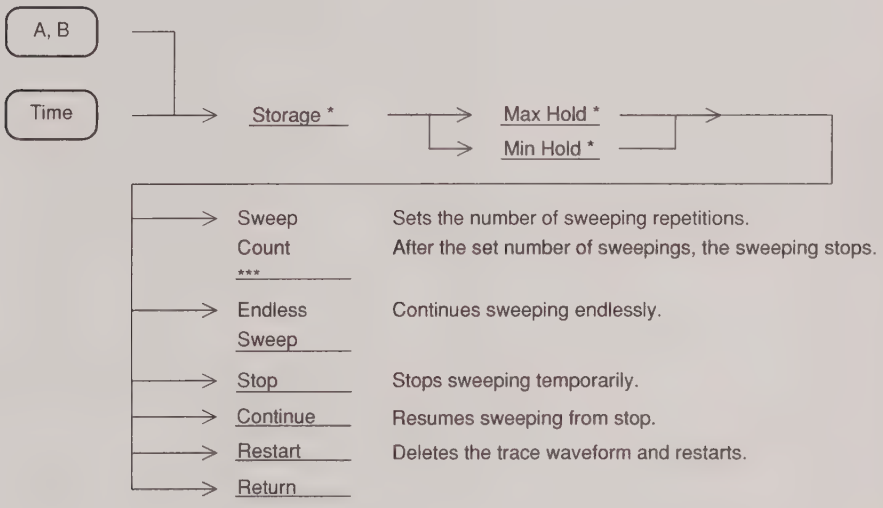
Averaging by video filter has the disadvantage that the sweep time becomes longer when the video bandwidth VBW is narrowed to improve the averaging effect.

On the other hand, digital video averaging smoothes the trace display by averaging the digital data after A/D conversion at each sweep, without narrowing the video bandwidth (VBW). Since the video bandwidth (VBW) gets comparatively wider and the time required for each sweep can be shortened, the entire spectrum image can be verified quickly and the repetitive sweep can be stopped when the required smoothing has been obtained. The problem of averaging with the video filter is that the time required for each sweep becomes longer and it takes a long time to verify the entire spectrum image.

Since the averaging rate is initially eight, the above figure shows that an S/N improvement of 9 dB is obtained with eight sweeps.

Max Hold and Min Hold Functions

When Max Hold or Min Hold is selected, the sweeping can be performed by the number of specified repetitions, and then stops.



Detection Mode

The detection mode can be selected from among Normal, Pos Peak, Sample, and Neg Peak for trace A and trace B.

Normal	Traces the maximum value and minimum value between sample points.
Pos Peak	Traces the maximum value between sample points.
Sample	Traces the instantaneous value between sample points.
Neg Peak	Traces the minimum value between sample points.
Average	Traces the averaging value between display points.
rms	Traces the execution value between display points. It is effective when Option 04 Digital Resolution Bandwidth is used.

However, trace BG is fixed at Pos Peak.
When the time span is under 5 ms at trace Time, only Sample is available.

Selecting Detection Mode

Select the detection mode for trace A, trace B, or trace Time by performing the following key operations.

A/B

Time

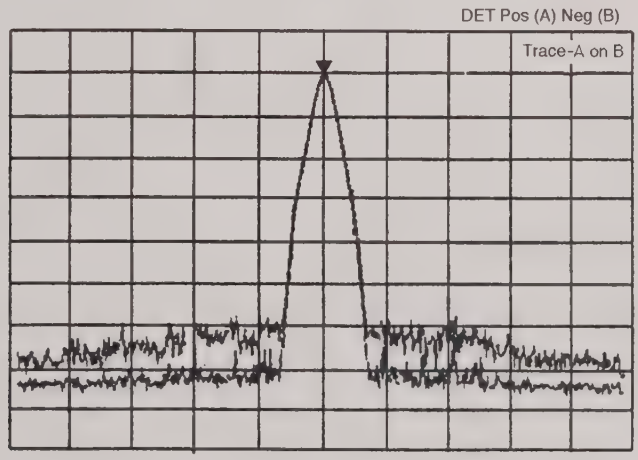
→ Detection *

→ Normal
→ Pos peak
→ Sample
→ Neg Peak
→ RMS
→ Return

Select the detection mode.

(Display page 2 of the menu by pressing the More key.)

→ Average

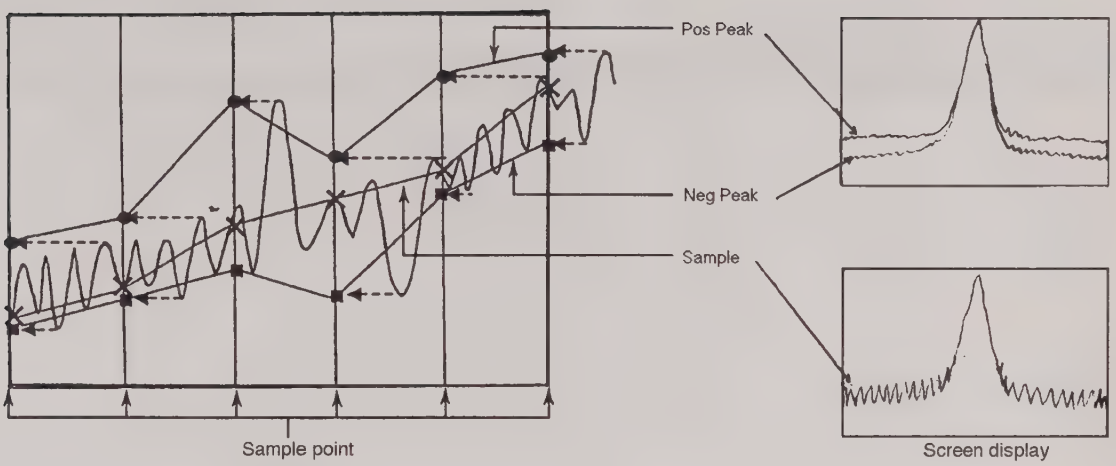


Waveforms when trace A is in the Pos Peak mode and trace B is in the NegPeak mode

Selecting Measured Level by Detection Mode

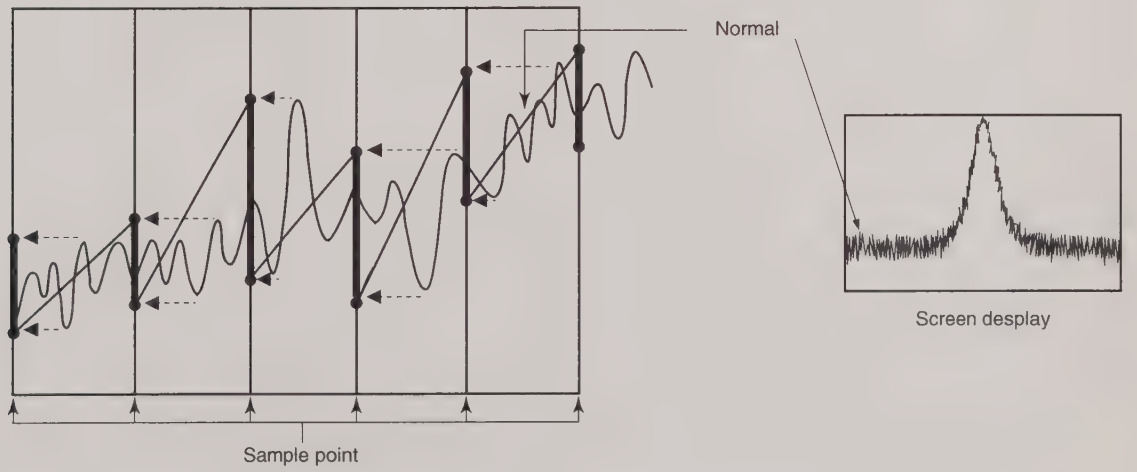
The spectrum analyzer has 501 or 1001 horizontal-axis measurement sample points. This corresponds to 501 or 1001 storage trace memories.
The detection mode determines what type of measured value should be stored in the trace memory at each measurement sample point.

Detection mode	Description
Normal	Stores both the maximum level and the minimum level present between the current sample point and the next sample point and displays them on the screen. This mode is used in normal measurement.
Pos Peak	Holds the maximum level present between the current sample point and the next sample point, then stores the maximum value in the trace memory corresponding to the current sample point. Pos Peak is used to measure the peak value of signals near the noise level.
Sample	Stores the instantaneous signal level at each sample point to the trace memory. Sample is used for noise level measurement, time domain measurement, and other measurements.
Neg Peak	Holds the minimum level present between the current sample point and the next sample point, then stores the minimum value to the trace memory corresponding to the current sample point. The Neg Peak mode is used to measure the lower envelope side of a modulated waveform.
RMS	Displays the square-root mean (effective) value of the signal input between the current display point and the next display point. This function is valid only when the MS8608A-04/MS8609A-04 Digital RBW is installed.
Average	Averages the AD sample values between the previous display point and next display point in Linear scale (Log converts to Linear). When measures the C/N and noise, improve the measurement speed to conventional sample detection.



Note:

When the detection mode is set to Sample or Neg Peak while the frequency span and resolution bandwidth are set so that the spectrum is displayed as discrete vertical lines, the spectrum peak is incorrectly displayed.



Normal traces and displays both Pos Peak and Neg Peak.

Setting of Trace point

SYSTEM → DATAPOINTS

501

1001

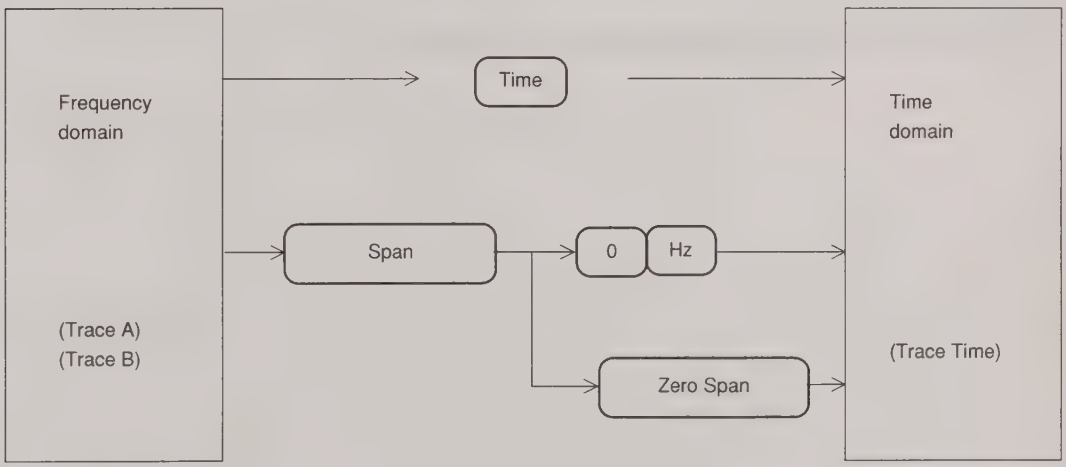
Number of sample points of a horizontal axis is set as 501 or 1001.

Time Domain

Since the spectrum analyzer stops sweeping the frequency when set to a frequency span of 0 Hz, the spectrum analyzer becomes a selective level meter that continues to receive only the center frequency. In this case, the horizontal axis of the time-axis sweep waveform is graduated in time and displayed on the spectrum analyzer screen. This display method is called "time domain display".
The spectrum analyzer time domain display has an Expand function for expanding the waveform time axis to create a more convenient display. It also has a special function for monitoring an FM demodulated waveform.

Setting Time Domain

The time domain can normally be set by pressing the Time key in the Display section. It can also be set by setting the frequency span to 0 Hz in the frequency domain mode.



The following parameters can be set independently in the frequency domain or time domain mode.

- Vertical scale mode (Log/Lin)
- Vertical scale range (10 dB/div, 10%/div, etc.)
- Storage mode (Normal, Max Hold, Average, etc.)
- Detection mode (Pos Peak, Sample, Neg Peak, Normal, Average)
- Resolution bandwidth (RBW)
- Video bandwidth (VBW)
- Sweep time (Sweep Time/Time Span)
- Trigger switch (Freerun/Triggered)

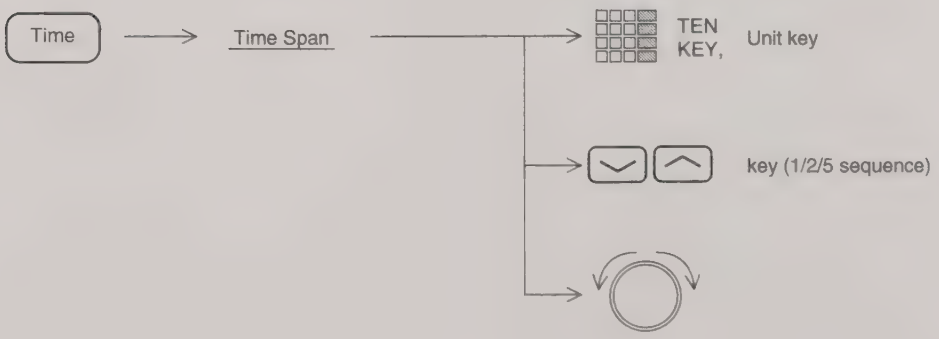
The three parameters resolution bandwidth, video bandwidth, and sweep time can be selected in common or independently in the frequency domain or time domain mode when setting the system.

Note:

The time domain mode marker function uses a spot marker. A zone marker cannot be used.

Setting Time Span

In the time domain mode, the measurement range on the horizontal axis does not set the frequency span, but sets the time span. To set the time span, perform the following key operations.

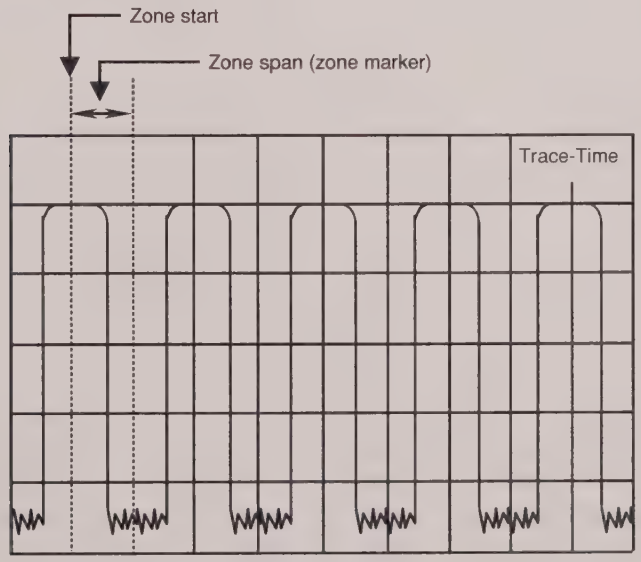


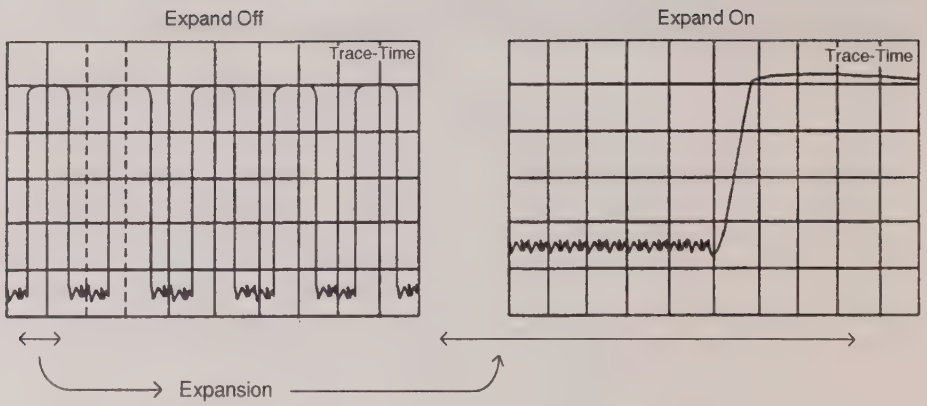
Time Domain Expanded Display

Part of the time domain time axis can be expanded and displayed.

Time → Expand *

- Zone Start Point 50 — Sets the expansion zone start point.
- Zone Span Point 50 — Sets the expansion zone width.
- Expand Zone On Off — Selects expansion zone marker display On or Off by pressing this key.
- Expand On Off — Selects expanded display On or Off by pressing this key.
- Return





The Expand mode cannot executed under the following conditions.

- Trigger mode ..... Freerun

Section 6 Selecting the Sweep Method

This section describes the sweep mode, trigger sweep mode, zone sweep, and signal tracking and time gate functions.

Sweep Mode 6-3
- Continuous Sweep Mode 6-3
- Single Sweep Mode 6-4

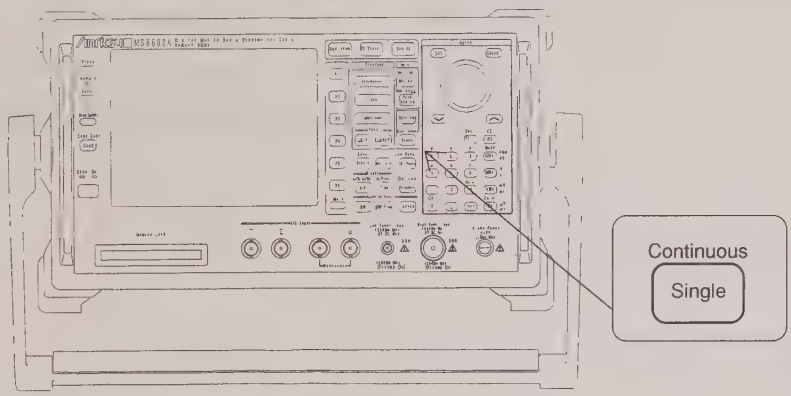
Trigger Mode 6-5
- Freerun 6-5
- Triggered 6-6
- Video Trigger 6-7
- Wide IF Video Trigger 6-8
- External Trigger 6-8
- Line Trigger 6-10
- Delay Time 6-10

Zone Sweep and Signal Tracking 6-12
- Zone Sweep 6-12
- Signal Tracking 6-13

Time Gate Function 6-14
- Creating a Gate Control Signal 6-17
- Setting Gate Function 6-18

Sweep Mode

The spectrum analyzer sweep mode is set by using the following key.



Continuous Sweep Mode

When the trigger mode is set to Freerun, sweep is performed continuously. When the trigger mode is set to Triggered, sweep is executed each time the trigger conditions are met.

To set the continuous sweep mode, perform the following key operation. (The continuous sweep mode is initially set.)

Single Sweep Mode

When the trigger mode is set to Freerun, sweep is executed once immediately after the Continuous Single key is pressed.

When the trigger mode is set to Triggered, sweep is executed only once when the trigger conditions are met after the Continuous Single key is pressed.

To set (sweep start) the single sweep mode, operate the following key.

Continuous
Single

Trigger Mode

The spectrum analyzer trigger mode can be divided into Freerun and Triggered.
In the Triggered mode, Video, Wide IF Video, External, or Line can be selected as the trigger source.

Freerun

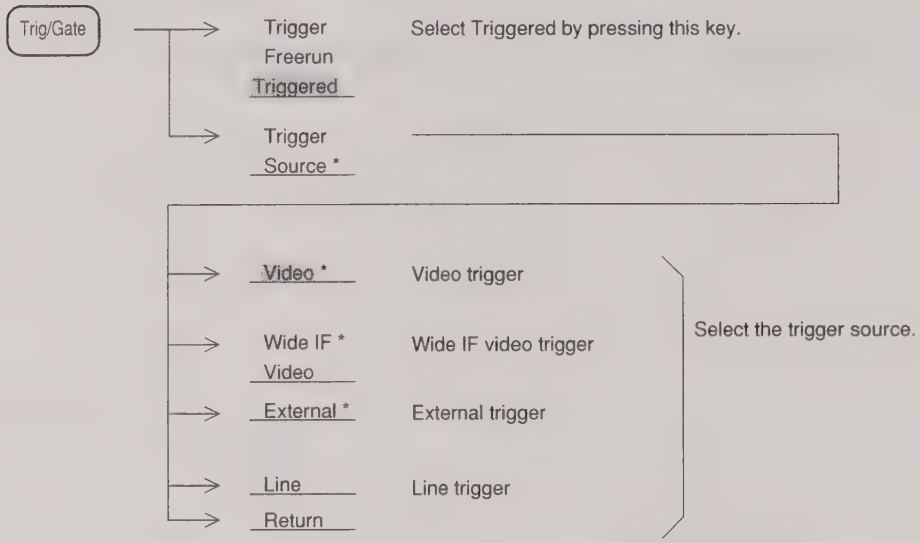
When the sweep mode is set to continuous, sweep is repeated continuously. When the sweep mode is set to single sweep, sweep is started immediately after the Continuous / Single key is pressed.

To set the Freerun mode, perform the following key operations. (The Freerun mode is initially set.)

Trig/Gate	→	Trigger Freerun Triggered	Select Freerun by pressing this key.

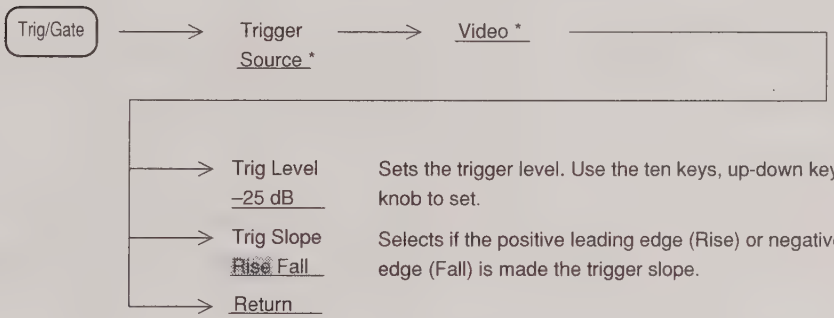
Triggered

When the conditions of the pre-selected trigger source are met, sweep is started.
To set the Triggered mode and to select the trigger source, perform the following key operations.

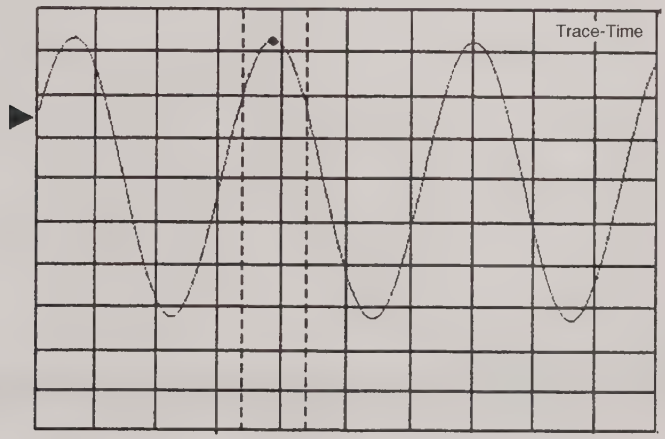


Video Trigger

Sweep is started in synchronization with the positive leading edge or negative leading edge of the detected waveform.
To select the trigger level and trigger slope, perform the following key operations.

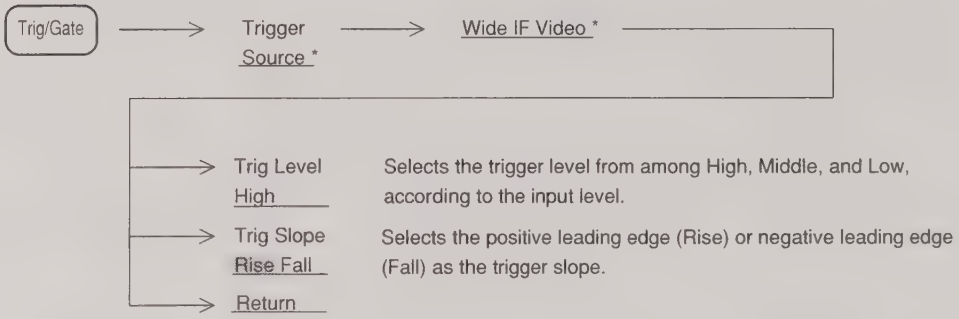

Trig/Gate
Trigger
Source *
Video *
Trig Level
–25 dB
Sets the trigger level. Use the ten keys, up-down keys, or rotary knob to set.
Trig Slope
Rise Fall
Selects if the positive leading edge (Rise) or negative leading edge (Fall) is made the trigger slope.
Return

The trigger level is indicated by displaying the trigger level indicator ▶ at the leftmost vertical line of the screen.



Wide IF Video Trigger

A wide bandwidth IF signal of at least 5 MHz is detected and sweep is started in synchronization with its positive leading edge or negative leading edge.
To select the trigger level and trigger slope, perform the following key operations.
Generally, there is no burst synchronizing signal and this signal is used as a burst wave gate control signal.


Trig/Gate
Trigger
Source *
Wide IF Video *
Trig Level
High
Selects the trigger level from among High, Middle, and Low, according to the input level.
Trig Slope
Rise Fall
Selects the positive leading edge (Rise) or negative leading edge (Fall) as the trigger slope.
Return

An indicator of appropriate trigger levels for Wide IF Video is listed below.

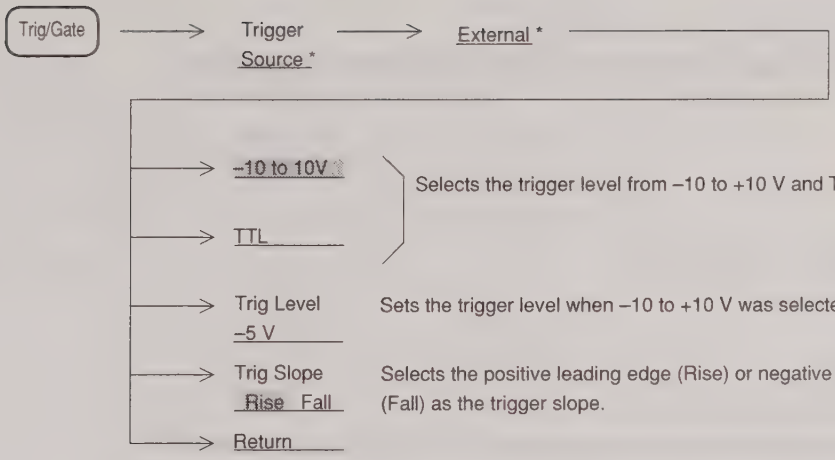
Trig Level	Mixer level*
High	–10 dBm (nominal)
Middle	–20 dBm (nominal)
Low	–30 dBm (nominal)

* This designed at 100 MHz.

Actual trig level is dependent of frequency of input.
Select the optimum Trig Level.

External Trigger

Sweep is started in synchronization with the positive leading edge or negative leading edge of the signal waveform input to the Ext Input connector on the rear panel. To select the trigger level and trigger slope, perform the following key operations.


Trig/Gate
Trigger Source *
External *
–10 to 10V
TTL
Selects the trigger level from –10 to +10 V and TTL.
Trig Level –5 V
Sets the trigger level when –10 to +10 V was selected.
Trig Slope Rise Fall
Selects the positive leading edge (Rise) or negative leading edge (Fall) as the trigger slope.
Return

(Example) When trigger level is –5 V and trigger slope is Rise

Line Trigger

This function starts sweep in synchronization with the AC power line frequency. Line trigger is conveniently used to observe power line-related hum waveform. With the line trigger function, the trigger level and trigger slope are not selected.

Trig/Gate → Trigger Source * → Line

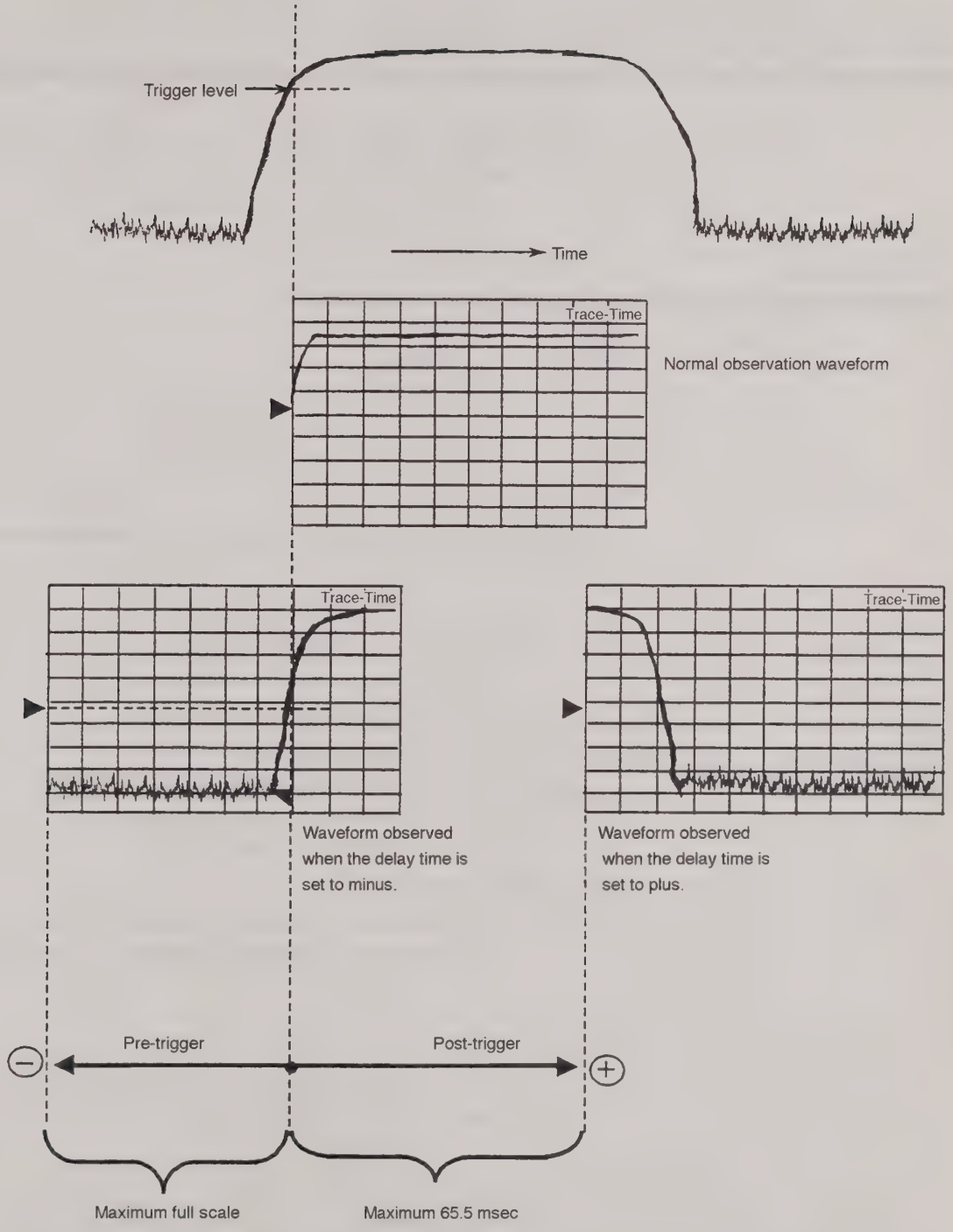
Delay Time

When the trigger mode is set to Triggered in the time domain mode, the trigger point is usually positioned at the left end of the screen. This, however, means that it is not possible to see the waveform before the trigger point and the waveform beyond the right end of the screen.
With the spectrum analyzer, a waveform away from the trigger point can be displayed by changing the delay time.
To set the delay time, perform the following key operations.

Trig/Gate → Delay Time 10.0 ms → Sets the delay time. Use the ten keys, up-down keys, or rotary knob.

Time

If the trigger point on the time axis on the screen was set by delay time, the trigger point indicator of ▶ mark is displayed at the bottom of the screen.



Example of Waveform With Delay Time (when used with video trigger)

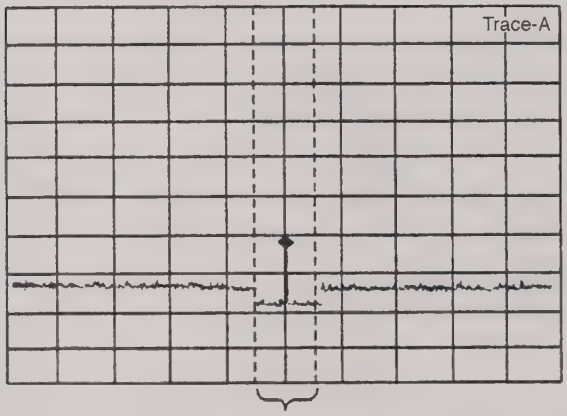
Zone Sweep and Signal Tracking

The spectrum analyzer has two sweep methods - zone sweep which sweeps only within the zone marker and a signal tracking function which detects the peak level frequency at each sweep, then moves it to the center of the zone marker.

Zone Sweep

Marker → Zone Sweep
On Off
(Display page 2 of the menu by pressing the More key.)

Zone sweep can be conveniently used to closely and quickly analyze part of the whole sweep range on the screen.

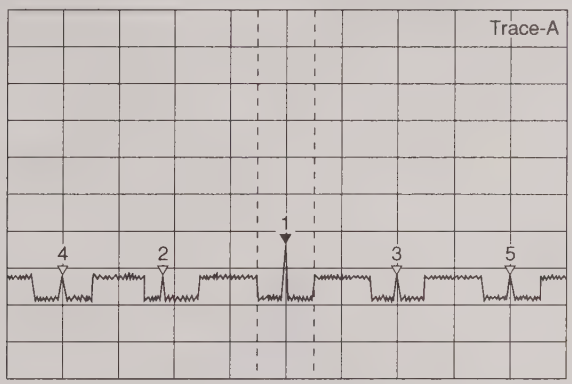


A signal masked by noise can be analyzed at high speed by setting zone sweep to On and adjusting the resolution bandwidth and video bandwidth.

Note:

Zone sweep cannot be executed while the marker is Off or when the instrument is in the time domain mode.

When the multimarker function is on, Each multimarker in on state is sequentially zone-sweeped (multi-zone sweep).



Signal Tracking

Marker ⟶ Marker Tracking
On Off
(Display page 2 of the menu by pressing the More key.)

The signal tracking function moves the frequency of the signal of the peak level in the zone marker to the center of the zone marker at each sweep. This is convenient when tracking and analyzing a signal whose frequency drifts.

Note:

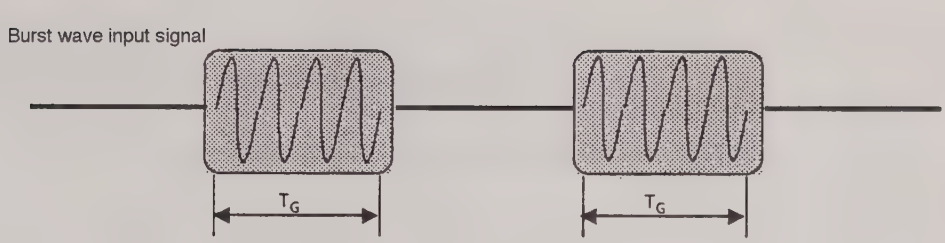
The signal tracking function cannot be executed while the marker is Off or when the instrument is in the time domain mode.

Time Gate Function

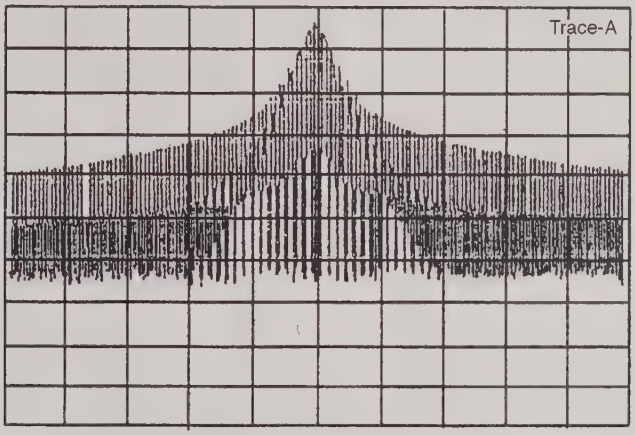
The time gate function is a sweep mode which turns the waveform data display On and Off by the gate control signal generated in the spectrum analyzer based on an external signal or video trigger signal.
Since the timing that displays the spectrum waveform can be set by using this mode, the spectrum when the burst signal is On can be analyzed.

In order to use the time gate function, an external trigger signal synchronized with burst wave On/Off or other signal change is required to create the gate control signal.

When an external synchronizing signal is unavailable, set the trigger source to wide IF video trigger. A synchronizing signal can be obtained internally.

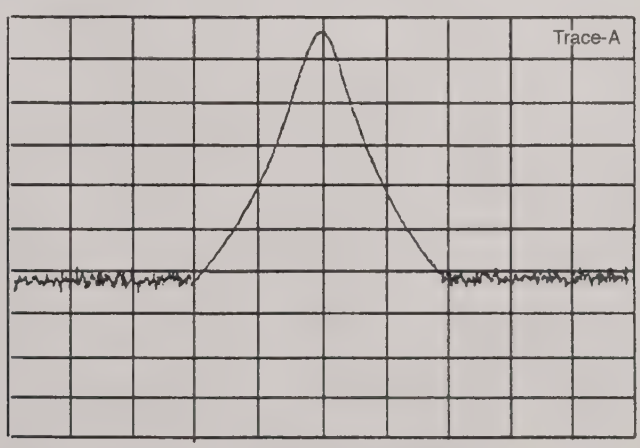


If the spectrum of the burst wave above is analyzed as it is,



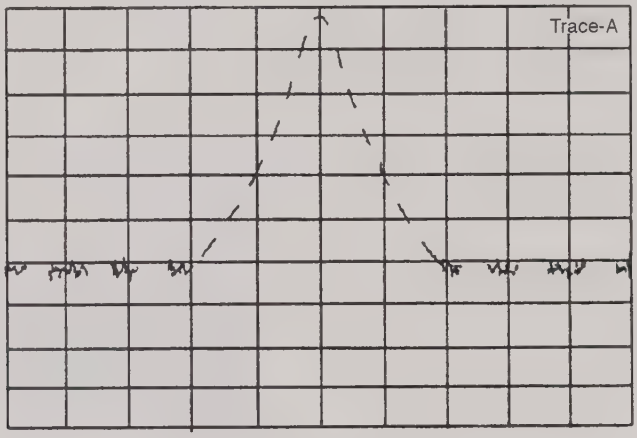
The spectrum spread by the positive leading edge or negative leading edge of the burst wave prevents the spectrum from being observed with the burst set to On.

If the spectrum can be analyzed only during the gate time T_G,

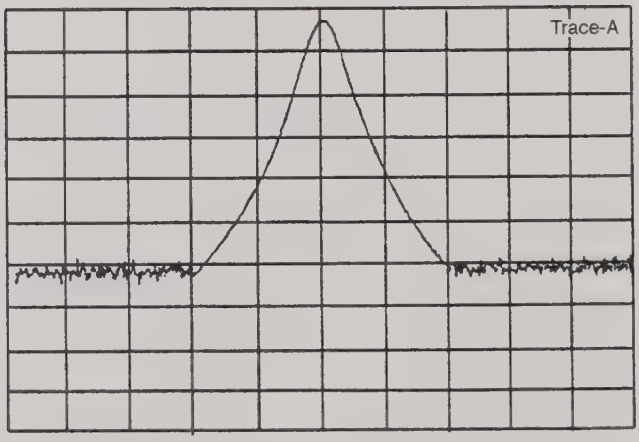


Only the spectrum when the burst is set to On is displayed.

When the time gate function is executed, sweep runs in the Freerun mode and only the waveform data validated by the gate control signal is refreshed. If the sweep period is not synchronized with the gate control signal, a perfectly shaped trace can be obtained by increasing the number of sweep repetitions.



Fewer Sweep Repetitions



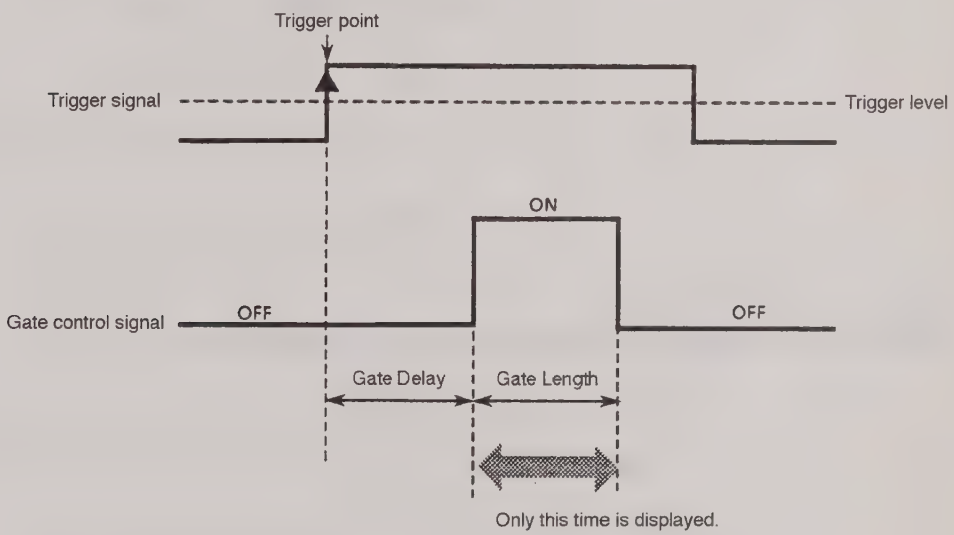
More Sweep Repetitions

Example of Frequency Spectrum Measurement on Burst Signal

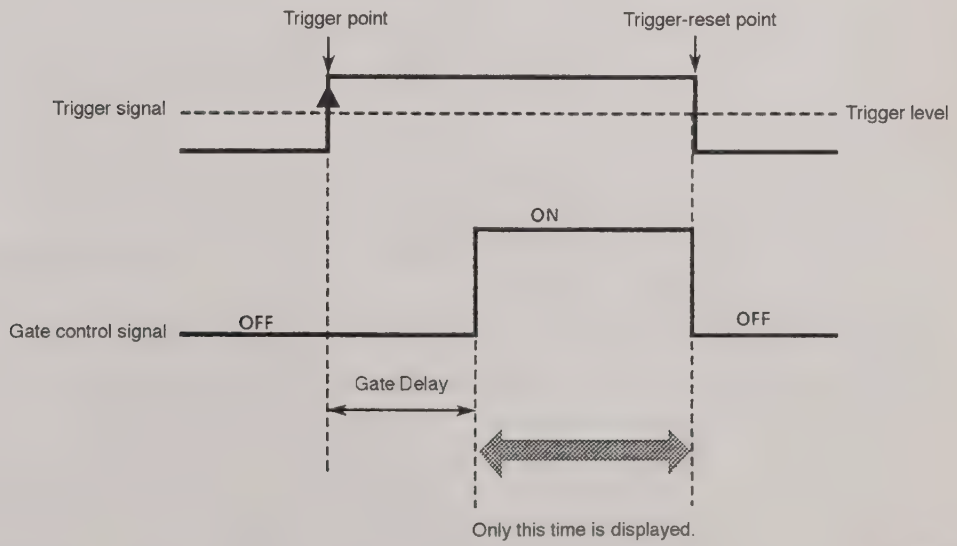
Creating a Gate Control Signal

If the point where an external trigger signal (Ext Input only) or a wide IF video trigger signal is triggered is assumed to be the reference position, the gate control signal remains On over the period from the point immediately after the Gate Delay time has elapsed from the reference position to the time set by Gate Length, or to the time reset by a trigger signal.

- Gate End: When Int selected



- Gate End: When Ext selected



To turn the gate time analysis function On and Off and to create the gate control signal, perform the following key operations.

Trig/Gate → (Display page 2 of the menu by pressing the More key.)

Gate Sweep On Off	Turns the gate function On and Off.
Gate Setup *	Sets the gate function.
Stop	Stops gate operation.
Restart	Restarts gate operation.
Delay Time	Sets the delay time from the trigged time.
Time Span	Sets the sweep time.

Setting Gate Function

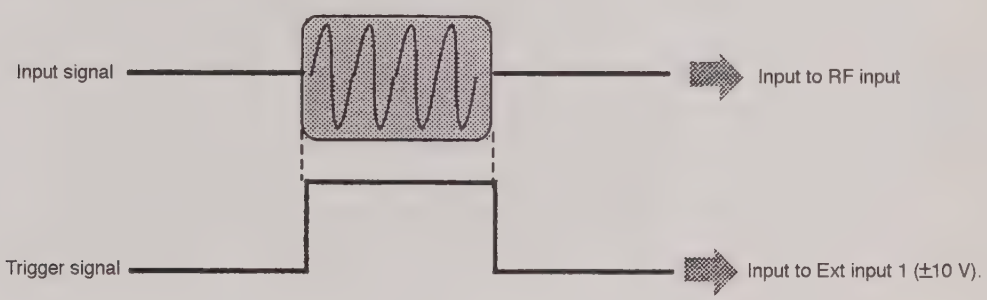
Trig/Gate → Gate Setup *

(Display page 2 of the menu by pressing the More key.)

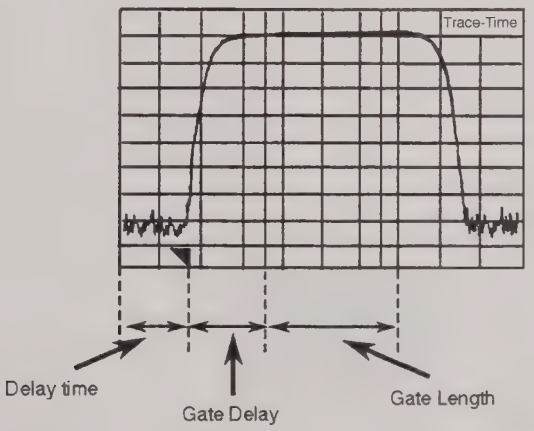
Gate Delay 0 us	Sets the gate delay time.
Gate Length 10 ms	Sets the gate time length.
Gate End Int Ext	Selects the condition that closes the gate. When Gate End is set to Int and Gate Length is set to Ext, the gate is closed by an external signal.
Wide IF * Video	Selects the trigger by Wide IF video.
External *	Selects the trigger by an external signal.
return	

The time domain mode facilitates setting the gate control signal time. The following shows an example of how to use the Time Gate function that uses the time domain mode.

Step	Procedure
1	Input the following signals to the spectrum analyzer.



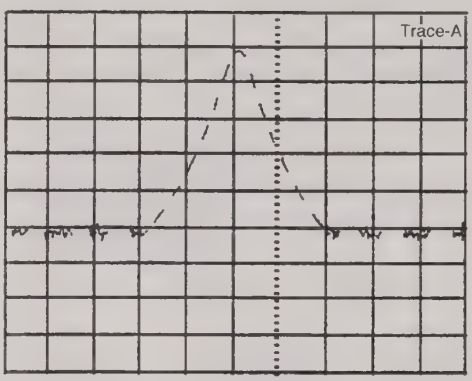
2 Display the waveform in the time domain mode. Synchronize the input signal by setting the trigger mode to Triggered and the trigger source to Ext Input 1 (–10 to 10 V).



3 Set Gate to On. Vertical lines (gate cursor) should appear at the Gate Delay and Gate Length positions. Set Gate Delay and Gate Length to appropriate positions while observing the waveform.

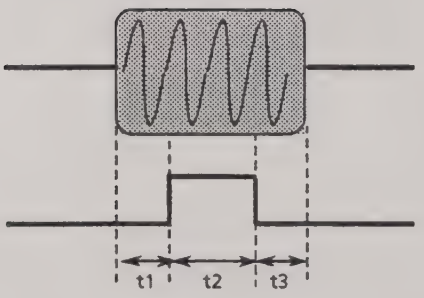
At this time, adjust the resolution bandwidth and video bandwidth in the time domain mode to equal those in the frequency domain mode, then set the gate cursor positions. The influence of spike-like noises independent of the conditions shown in Note [1] described later can be avoided.

Step	Procedure
4	Set the frequency domain mode. The trigger mode becomes Freerun and the waveform data is displayed only for the time set by Gate Length.



Notes:

[1] The detector output is delayed compared to the positive leading edge of the input waveform when the resolution bandwidth (RBW) is narrowed in the frequency domain measurement mode. As a result, spike-like noises may appear on the trace. To prevent this from appearing, set Gate Delay and Gate Length to values that satisfy the following conditions.



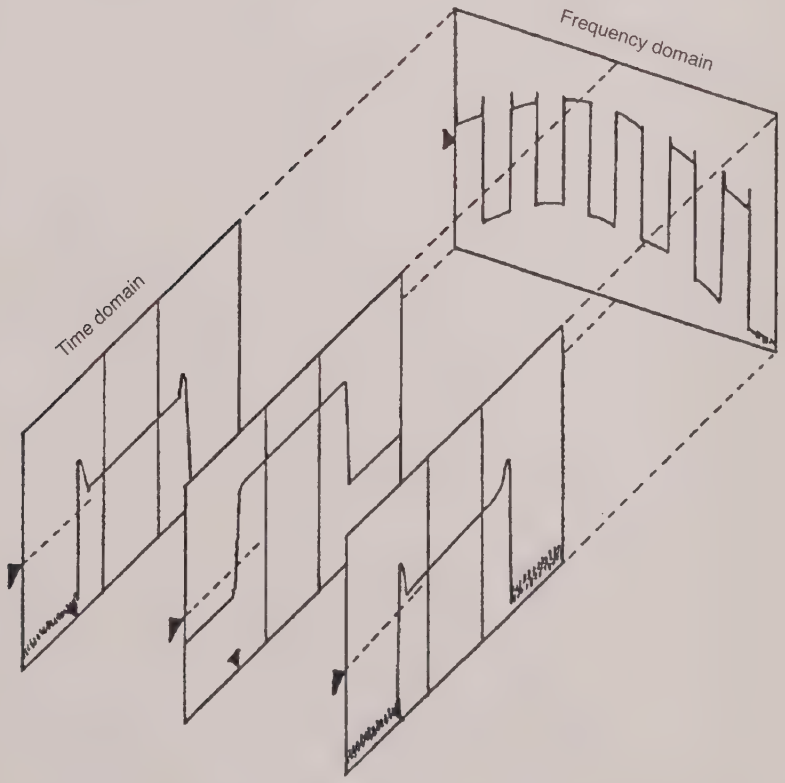
RBW	t1	t2	t3
1 kHz	≥3 ms	≥20 µs	≥1 µs
3 kHz	≥1 ms		
10 kHz	≥230 µs		
30 kHz	≥200 µs		
100 kHz	≥20 µs		
300 kHz	≥15 µs		
1 MHz 5 MHz	≥10 µs		

[2] When the resolution bandwidth (RBW) is extremely narrow for the frequency span, some waveforms cannot be displayed correctly. Set each parameter so that the following conditions are satisfied.

$$RBW \geq \frac{Span}{Number\ of\ data\ points\ ^{*}} \times 5$$

* Setup to 501 or 1001 is possible for the number of data points.

[3] The Time Gate function can use a video trigger as the gate control signal. In this case, the gate control signal must be generated correctly so that a trigger can be normally set with the same RBW, VBW, and trigger level conditions at all frequencies within the frequency span observed in the frequency domain. (See the figure below.)



Trigger can be applied by the gate control signal created internally by setting the trigger source to Wide IF Video.

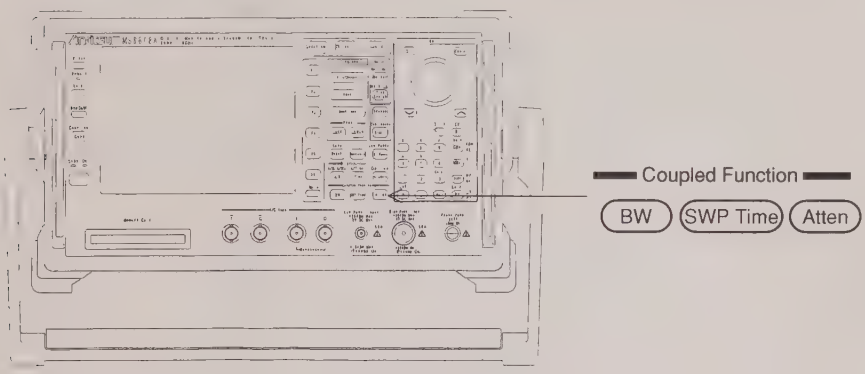
Section 7 Coupled Function

This section describes the coupled function. Generally, the spectrum analyzer automatically selects the optimum values of the coupled function so that both the correct level and correct frequency values can be measured. This is called the Auto Coupled Function.

This section mainly describes manual settings that are used to set the coupled function according to the application.

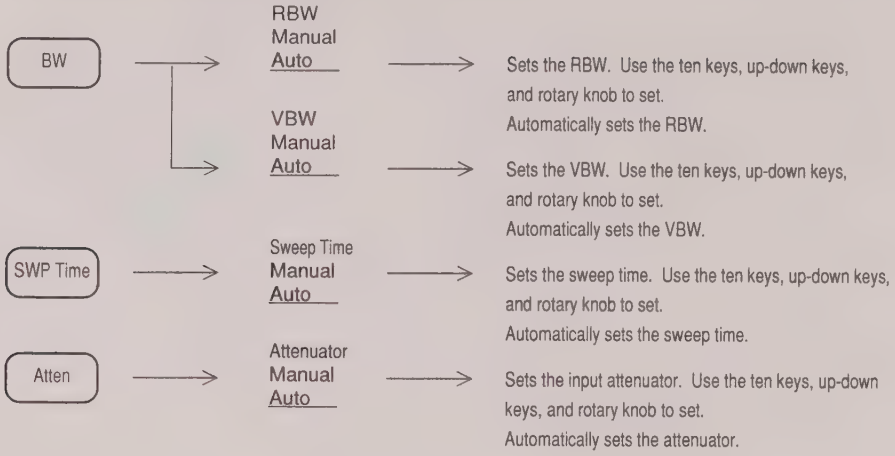
From Auto to Manual Operation 7-4
Resolution Bandwidth (RBW) and Sweep Time 7-5
Video Bandwidth (VBW) 7-8
Input Attenuator (Atten) 7-10
Coupled Function Common/Independent Setting Mode 7-12
Ratio setup of Resolution Bandwidh 7-13
Noise reduction Function 7-14

The coupled function of the four functions Resolution Bandwidth (RBW), Video Bandwidth (VBW), Sweep Time, and Attenuation (Atten) is initially set to Auto so that the spectrum analyzer can automatically select the optimum setting.



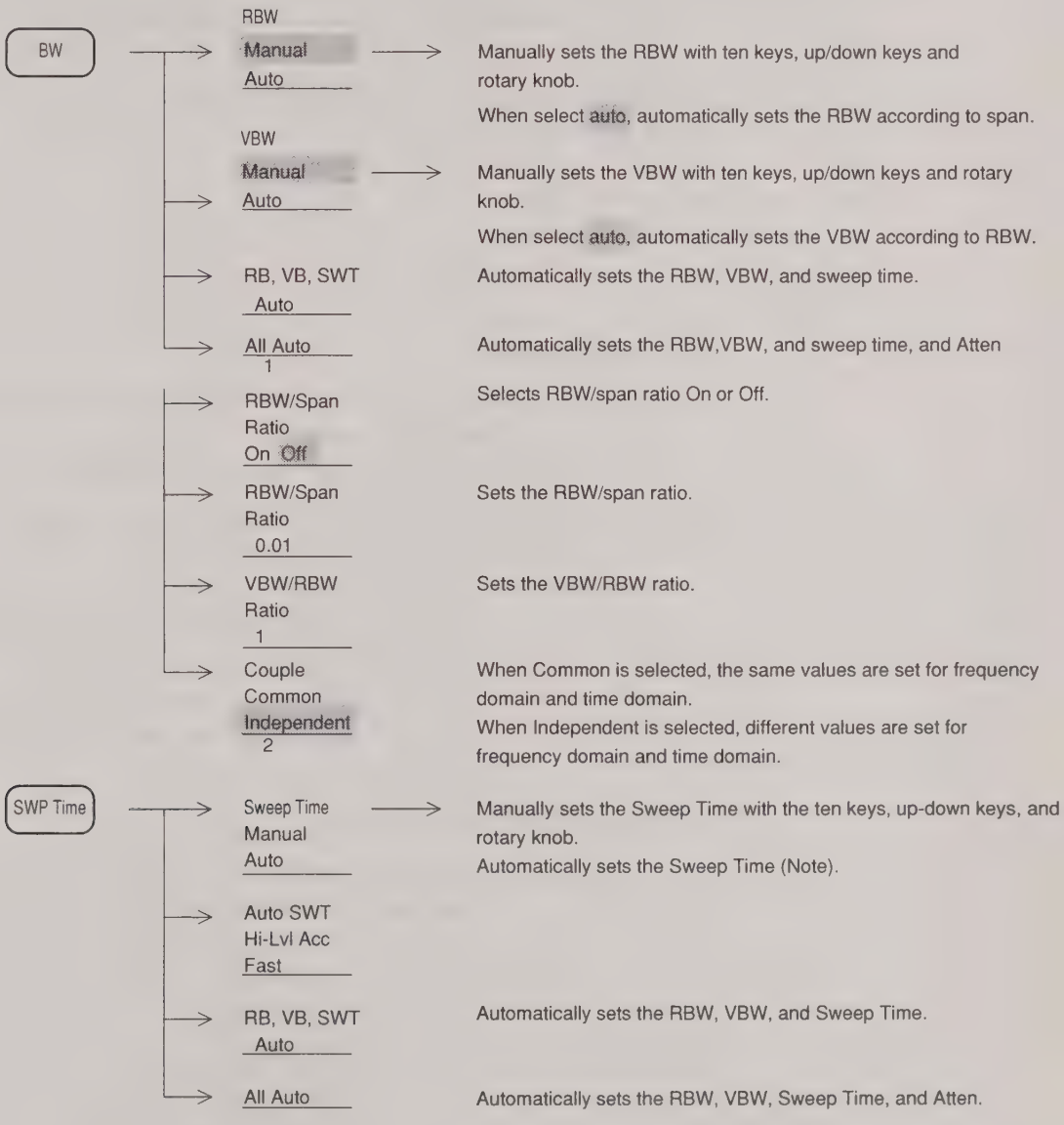
From Auto to Manual Operation

Perform manual setting as follows:


BW
RBW
Manual
Auto
Sets the RBW. Use the ten keys, up-down keys, and rotary knob to set.
Automatically sets the RBW.
VBW
Manual
Auto
Sets the VBW. Use the ten keys, up-down keys, and rotary knob to set.
Automatically sets the VBW.
SWP Time
Sweep Time
Manual
Auto
Sets the sweep time. Use the ten keys, up-down keys, and rotary knob to set.
Automatically sets the sweep time.
Atten
Attenuator
Manual
Auto
Sets the input attenuator. Use the ten keys, up-down keys, and rotary knob to set.
Automatically sets the attenuator.

Resolution Bandwidth (RBW) and Sweep Time

To set the RBW and Sweep Time, perform the following key operations.


BW
RBW
Manual
Auto
Manually sets the RBW with ten keys, up/down keys and rotary knob.
When select auto, automatically sets the RBW according to span.
VBW
Manual
Auto
Manually sets the VBW with ten keys, up/down keys and rotary knob.
When select auto, automatically sets the VBW according to RBW.
RB, VB, SWT
Auto
Automatically sets the RBW, VBW, and sweep time.
All Auto
1
Automatically sets the RBW,VBW, and sweep time, and Atten
RBW/Span Ratio
On Off
Selects RBW/span ratio On or Off.
RBW/Span Ratio
0.01
Sets the RBW/span ratio.
VBW/RBW Ratio
1
Sets the VBW/RBW ratio.
Couple
Common
Independent
2
When Common is selected, the same values are set for frequency domain and time domain.
When Independent is selected, different values are set for frequency domain and time domain.
SWP Time
Sweep Time
Manual
Auto
Manually sets the Sweep Time with the ten keys, up-down keys, and rotary knob.
Automatically sets the Sweep Time (Note).
Auto SWT
Hi-Lvl Acc
Fast
RB, VB, SWT
Auto
Automatically sets the RBW, VBW, and Sweep Time.
All Auto
Automatically sets the RBW, VBW, Sweep Time, and Atten.

(1) Auto mode

The RBW, Sweep Time, and VBW parameters are set to Auto so that even if the frequency span is varied, the respective parameters are automatically set to the optimum values so that frequency and level measurement errors do not occur.

The following shows the Swp Time Auto setting range:

- Lower limit value

  10 msec

- Upper limit value

  1000 sec

(2) Manual setting

If RBW, VBW, and Sweep Time are set to the Auto mode, normal measurements can be made without considering their settings.
However, in the following cases, RBW should be set to the Manual mode.

General measurements: When observing two adjacent signals, increasing the frequency resolution by narrowing the RBW can reduce the noise level (a tenth part of the current RBW results in a 10 dB reduction). However, if the RBW is too narrow, the spectrum waveforms will become too steep, the response characteristics become worse, and the sweep time will also become longer. Therefore, the RBW value should be determined to give a practical sweep speed.

Intermodulation distortion measurement:

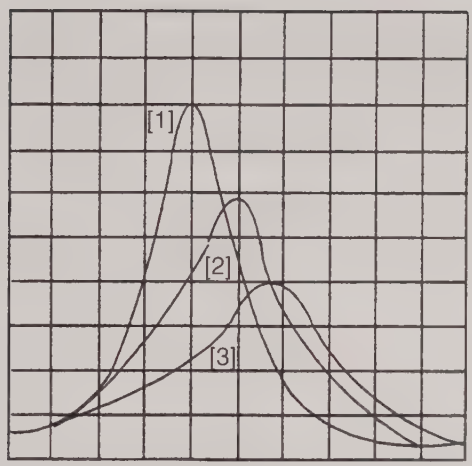
When measuring two signal intermodulation distortion with a comparatively wide frequency span and a reduced noise level, the RBW value should be narrowed by manual setting. However, the sweep time increases in inverse proportion to the square of the RBW.

The RBW can be selected from among the following by Manual setting:

300 Hz, 1 kHz, 3 kHz, 10 kHz, 30 kHz, 100 kHz, 300 kHz, 1 MHz, 3 MHz, 5 MHz, 10 MHz, 20MHz

Note:

RBW = 20 MHz is available at Band 0, because pre-selector band-width does not effect RBW at Band 0.



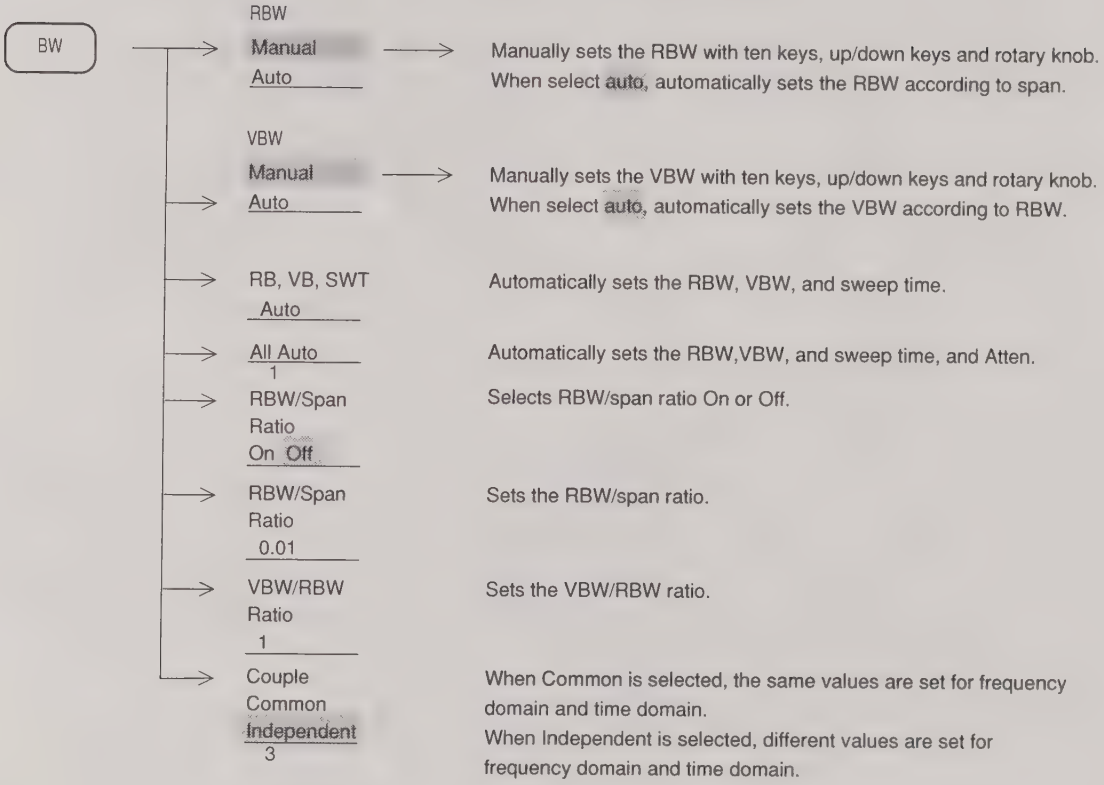
[1] Optimum trace waveform
[2], [3] UNCAL trace waveforms

Note:

The spectrum traces on the screen are displayed as shown at the left according to the sweep time. The optimum sweep time gives a waveform like [1]. However, a sweep time that is too fast decreases the waveform amplitude on the display as shown in [2] and [3]. Therefore, the apparent bandwidth gets wider, and the frequency also shifts. When waveform [1] cannot be maintained, "UNCAL" is displayed.

Video Bandwidth (VBW)

To set the VBW, perform the following key operations.



(1) Auto mode

When VBW is set to Auto, the product of the RBW set value multiplied by the VB/RB Ratio is set. Since VB/RB Ratio is initially set to 1, RBW and VBW are set to the same value.

By setting the VB/RB Ratio to a small value, since VBW is set to a narrow value according to the RBW setting, noise can be efficiently averaged.

Note:

Since the VBW setting range is 1 Hz to 3 MHz, if an attempt is made to exceed this range, the VBW is set to 1 Hz or 3 MHz.

(2) Manual setting

When wanting to average the noise by making the VBW narrow without regard to the RBW set value, or when wanting to make the VBW wide to observe the waveform of signals modulated at a high frequency, use Manual setting.

The VBW value can be manually set from among the following values:

1 Hz, 3 Hz, 10 Hz, 30 Hz, 100 Hz, 300 Hz, 1 kHz, 3 kHz, 10 kHz, 30 kHz, 100 kHz, 300 kHz, 1 MHz, 3 MHz, OFF

Note:

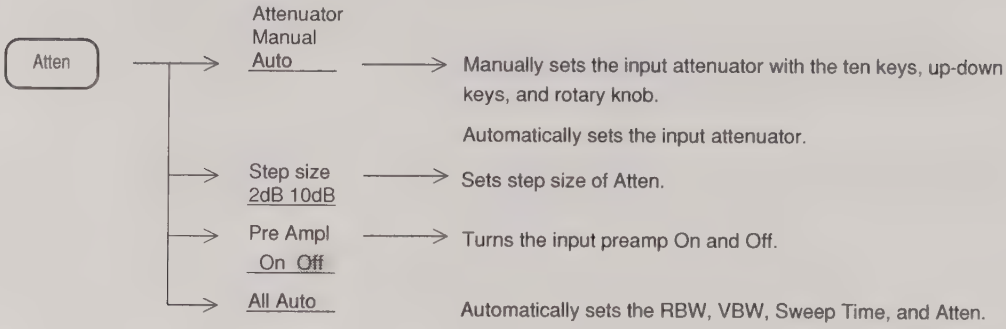
- When VBW ≥ RBW is set, noise is not averaged and the sweep speed is increased.
- Noise can also be averaged without narrowing the VBW (without decreasing the sweep time) by performing video averaging. For further details, see SECTION 5.

(3) Setting VBW when using Option 04: Digital RBW

VBW is not settable in Digital RBW mode.
Averaging using RMS detector in the Digital RBW mode is executed by setting sweep time long.
Increasing sweep time improves S/N.

Input Attenuator (Atten)

To set the input attenuator, perform the following key operations.



(1) Auto mode

When the reference level is set while Auto is selected, the input attenuator is automatically set to the optimum value according to the reference level.

(2) Step size

Atten step size is selectable 2 dB or 10 dB. When measuring the spurious (Harmonics and inter modulation), use 2 dB step size to suppress spurious that is generated by spectrum analyzer, and also to improve dynamic range and measurement speed.

(3) Manual setting

When a signal with the same level as the reference level is input, the input attenuator value in the Auto mode is controlled so that high accuracy measurements can be made without being influenced by gain compression and the noise level can be reduced. However, when you want to measure a low level signal by raising the sensitivity when measuring nonharmonic spurious response and the spurious response of adjacent signals, measurement may be impossible because the Atten values in the Auto mode are too large. In this case, set the input attenuator manually according to the table above.

Reference Level and Input Attenuator (Manual)

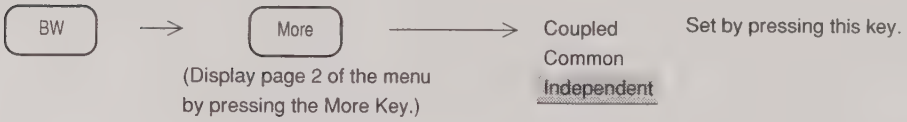
Reference Level effective range (dBm)	Atten Manual (dB)
+30 to –40	60
+30 to –50	50
+30 to –60	40
+20 to –70	30
+10 to –80	20
0 to –90	10
–10 to –100	0

A small input attenuator value can be set within the range at which internal mixer level = {(same input level as reference level) – (input attenuator set value) is –10 dBm or less.

For second and third harmonic measurements, the influence of internal distortion must be eliminated by decreasing the mixer input level. Because the internal distortion is –80 dB when the mixer input level is –30 dBm, when wanting to measure spurious harmonics up to –80 dB, the mixer input level must be made –30 dBm or less. In this case, set the input attenuator manually because the Atten value in the Auto mode is too small.

Coupled Function Common/Independent Setting Mode

At factory shipment, the four coupled functions RBW, VBW, Sweep time (Time Span), and Atten are set to have the independent value for frequency domain and time domain. When these coupling functions are desired to be used with the same sense of operation as zero span of a traditional spectrum analyzer, they can be set commonly by making the following system settings.



Common ..... The same values are set for both frequency domain and time domain.

Independent ..... Different values are set for frequency domain and time domain.

The Atten value connot be set independently. When the coupled mode is set to Independent, "RBW" and "VBW" displayed at the top of the screen change to "RBWt" and "VBWt", respectively.

Note:

The sweep time (time span) setting range and resolution in the frequency domain and the time domain differ as shown below. In some cases, the same values cannot be obtained even if the coupled mode is sent to common.

Frequency domain
10 msec to 1000 sec
Resolution: 5 ms (10 ms to 1 s)
High-order 3 digits (1 s to 1000 s)

Time domain
1 µs to 1000 s
Resolution: 1, 2, 5 sequence (1 µs to 100 µs)
100 µs (100 µs to 4.9 ms)
5 ms (5 ms to 1 s)
High-order 3 digits (1 s to 1000 s)

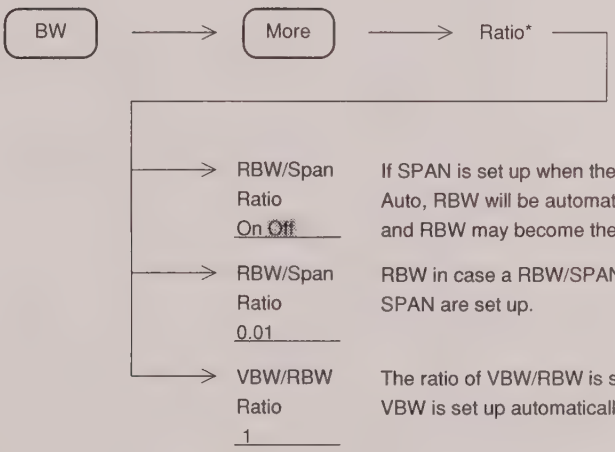
Example: After switching to the time domain mode to set the time span to 100 μ sec when the sweep time is 300 msec int the frequency domain mode, the display mode retrurns to the frequency domain mode.

↓

Since the lower limit value of the sweep time that can be set in the frequency domain mode is 10 msec, the sweep time is set to the 10 msec nearest to 100 μ sec. Then, when the display mode switches to the time domain mode, time span is renewed to 10 msec.

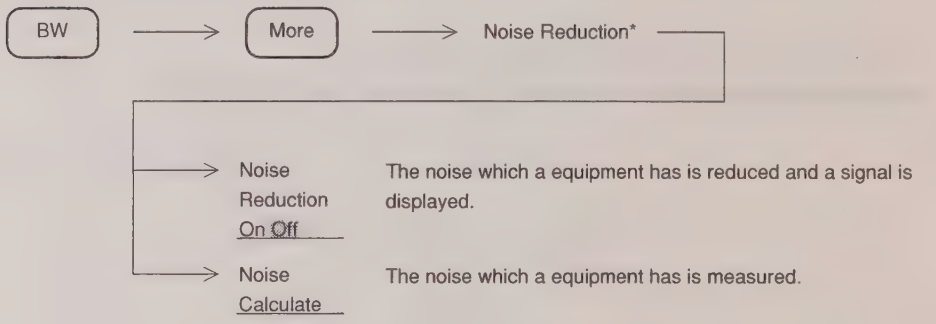
Ratio setup of Resolution Bandwidh

It is possible to set up the ratio of RBW, SPAN, and RBW and VBW.


BW
More
Ratio*
RBW/Span Ratio
On Off
If SPAN is set up when the coupled function of RBW is set as Auto, RBW will be automatically set up so that the ratio of SPAN and RBW may become the same.
RBW/Span Ratio
0.01
RBW in case a RBW/SPAN ratio function is ON, and the ratio of SPAN are set up.
VBW/RBW Ratio
1
The ratio of VBW/RBW is set up. According to a setup of RBW, VBW is set up automatically.

Noise reduction Function

In case a Noise reduction function performs measurement which needs a larger dynamic range, it is a function to reduce the noise which a equipment has by calculation.
This function is effective in option 04 digital resolution bandwidth at the time of use.


BW
More
Noise Reduction*
Noise Reduction On Off
The noise which a equipment has is reduced and a signal is displayed.
Noise Calculate
The noise which a equipment has is measured.

A noise reduction function performs the following processing and displays a measurement signal.
Noise electric power which a equipment has (at the time of a non-signal input): Ns, Inputted signal electric power: S,
If result: D displayed
It is set to D=Ns+S and the electric power compounded in the form where it was influenced of the noise ingredient which a equipment has is displayed.
Noise reduction function is a function which calculates this Ns beforehand and displays it.

$$D = (Ns + S) - Ns$$

The notes on this functional use

At the time of Noise Calculate execution, it carries out in the state where a signal is not inputted. When you change measurement parameters (frequency, SPAN, input attenuator ,resolution bandwidth, referenece level, etc.), please perform Noise Calculate each time. To the last, by calculation, this is a function which reduces noise, is NF which hardware has and distortion performance is not improved.

Section 8 Automatic Calibration and Level Correction Function

This section describes the internal calibration function and measuring system level correction function which minimize the spectrum analyzer measurement error.

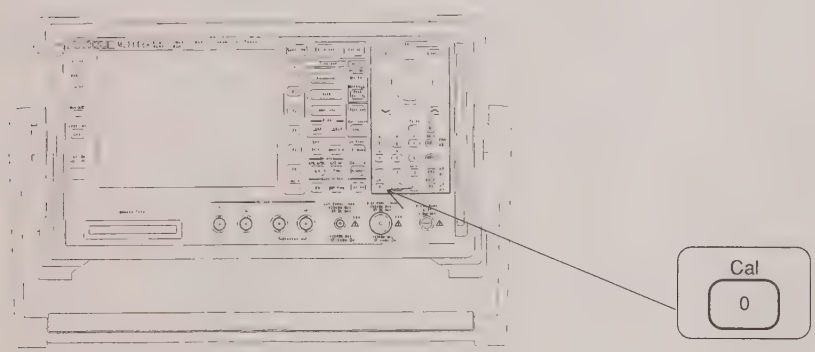
Automatic Calibration Function ..... CAL ... 8-3
Automatic Calibration 8-4
Details of Each Calibration Item 8-5
Preselector tuning 8-6
Measurement System Level Correction 8-7

Automatic Calibration Function .....CAL

The spectrum analyzer incorporates a 625 kHz, 50 MHz calibration oscillator and a calibration attenuator, which perform automatic calibration so that the spectrum analyzer can minimize measurement errors and make high accuracy measurements.

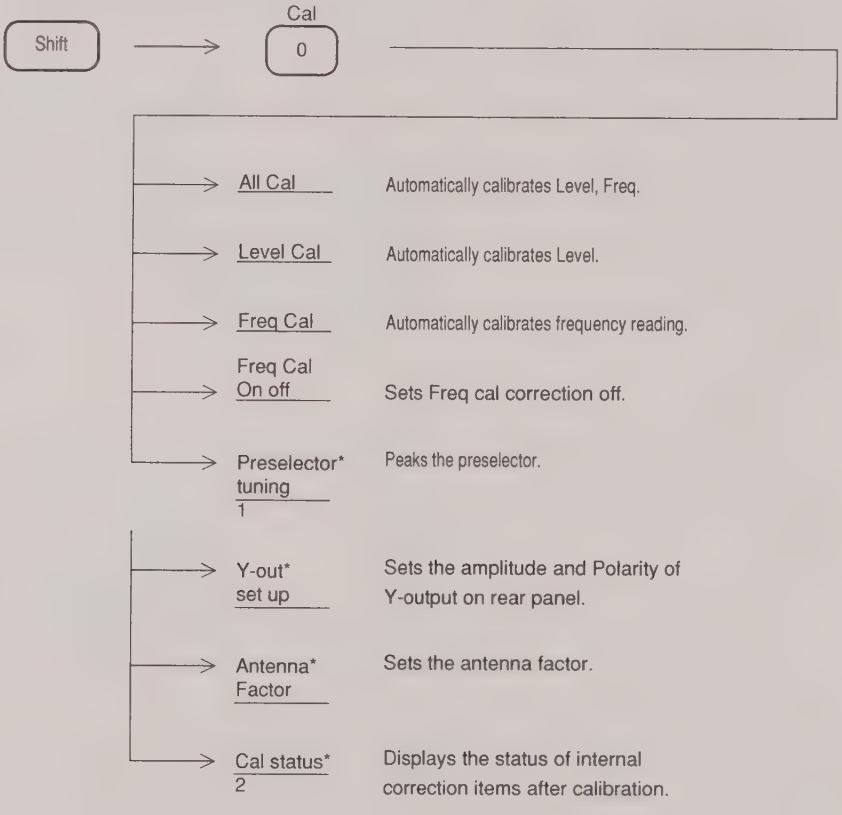
WARNING ⚠

If calibration is executed with an external signal applied to the RF input, the correct calibration value cannot be obtained. Perform calibration without applying a signal to the RF input connector.



Automatic Calibration

Execute spectrum analyzer automatic calibration by performing the following key operations.



Details of Each Calibration Item

The following describes the items that are calibrated by the automatic calibration function and the items that are calibrated at the factory.

ALL CAL	LEVEL CAL	Reference level error calibration	Calibrates the absolute-value levels on the LOG/LIN scale.
		LOG-scale linearity calibration	Calibrates the LOG-scale linearity.
		IF Gain switching error correction	Calibrates the error caused by the IF gain from among the level errors when the reference level is switched.
		RBW switching error calibration	Calibrates the error when the resolution bandwidth (RBW) is switched.
		Detection-mode switching error calibration	Calibrates the level error when the detection mode (Pos Peak, Sample, Neg Peak) is switched.
		Input-attenuator/pre-amplifier switching error calibration	Calibrates the level error when the input-attenuator/pre-amplifier is switched.
	FREQ CAL	RBW center frequency calibration	Calibrates the center frequency error when the resolution bandwidth (RBW) is switched.
		RBW bandwidth measurement	Measures the RBW bandwidth used for noise measurement bandwidth conversion.
Factory Calibration		Frequency response calibration	Calibrates the amplitude frequency response over the entire band.

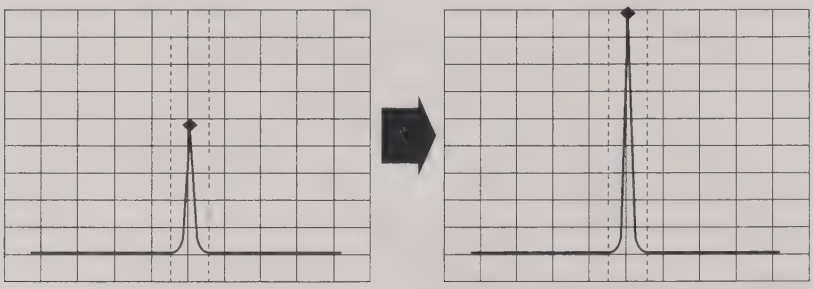
When ALL CAL is executed, the calibration data is retained by the built-in battery back-up even when the spectrum analyzer power is turned off. Therefore, it is not always necessary to execute automatic calibration each time the power is turned on. However, when a particularly high accuracy measurement is required, when the specifications are not met, or when the set-up circumstances have changed greatly (such as ambient temperature), execute automatic calibration again.

Notes:

- Since the built-in calibration oscillator is automatically connected internally when automatic calibration is executed, external connection is unnecessary.
- Unless the frequency span is taken into account, the measurement frequency error depends on the local oscillator frequency error and the IF center frequency error. The local oscillator is a synthesizer system and its frequency error depends on the frequency accuracy of the reference crystal oscillator or external reference signal input. Frequency-related automatic calibration calibrates the IF center frequency error.

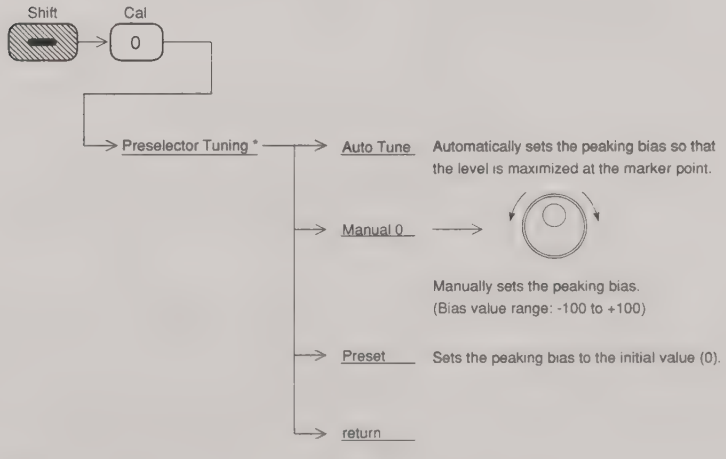
Preselector tuning

Since this equipment is a super heterodyne type spectrum analyzer, it generates unrequired wave responses such as image responses and multiple responses.
This equipment uses a preselector to remove these unrequired wave responses and to display only true signals on the screen. The preselector is a variable synchronous type bandpass filter that follows the receiving frequency of an analyzer. Since the MS8608A/ MS8609A uses the preselector in the band, the peaking is described below:
In normal use, since the initial value of the peaking bias is set for each frequency, peaking is required only when the bias value is shifted purposely.
If it is shifted, the receiving level is decreased as shown in the diagram at the bottom left. Accordingly, perform peaking so that the maximum response can be obtained as shown in that figure.



elector peaking　　State of optimum peaking bias

Perform peaking using the following method.



Note:

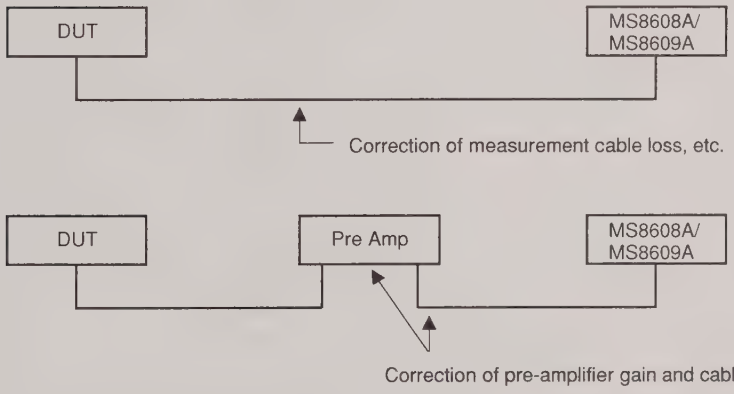
Preselector Auto Tuning cannot be done when:

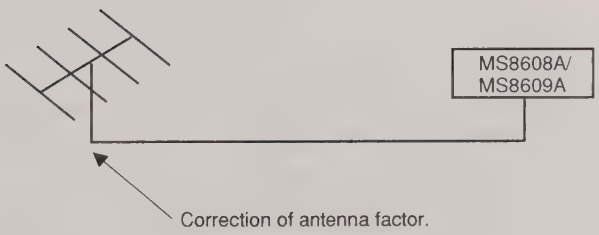
- The frequency span exceeds 500 MHz.
- Trace BG is the main trace in the trace A/trace BG indication.

Measurement System Level Correction

When making measurements with a spectrum analyzer, it may be necessary to correct the error and gain of the measurement system. The following are examples of this.

[1] Frequency characteristics and loss of measurement cables
[2] Frequency characteristics and loss of pre-amplifier, etc. connected to RF input connector
[3] When wanting to measure the field strength with an antenna or near-field probe connected (antenna factor correction)

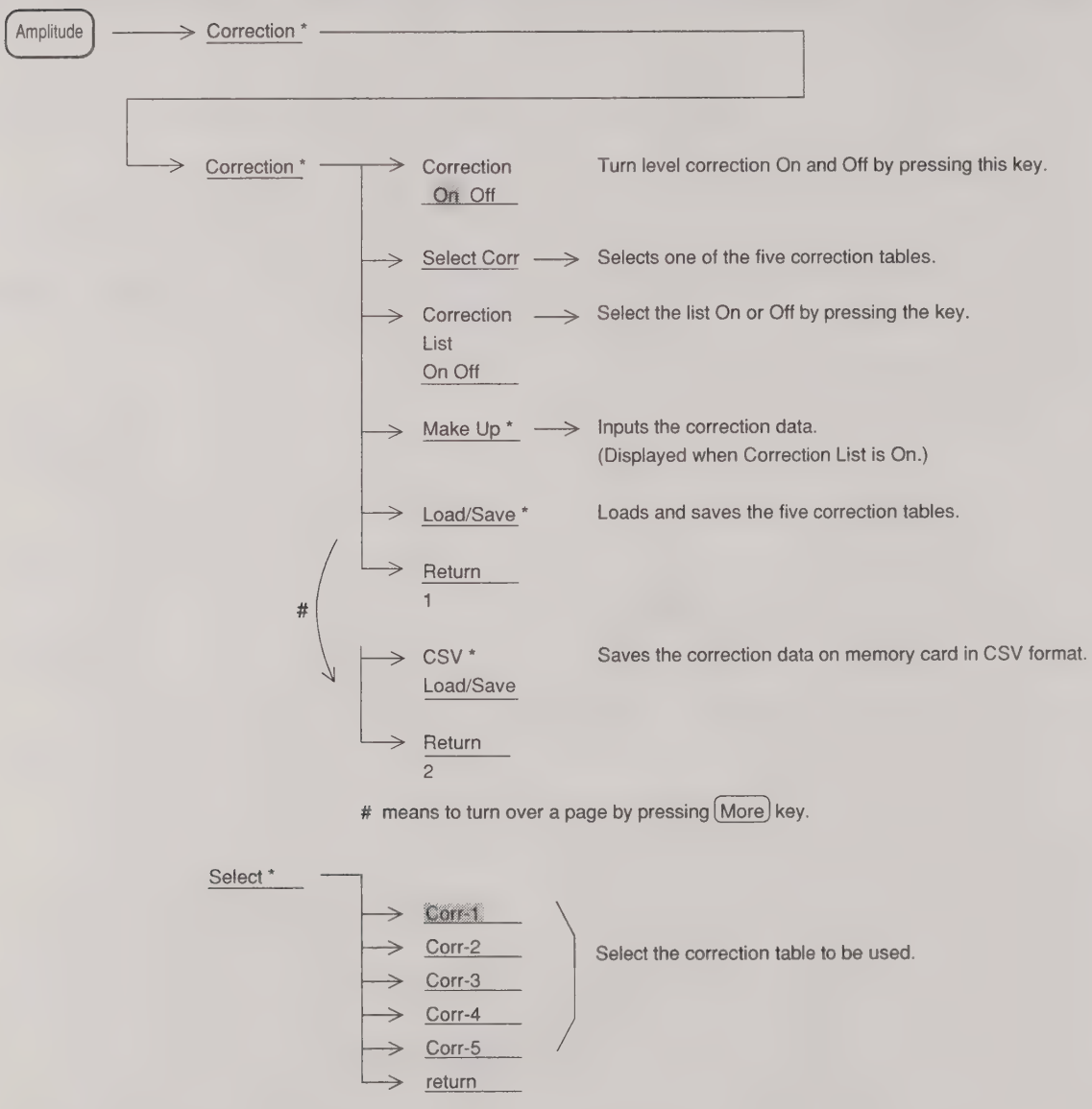




The correction factors for these measurement systems can be stored in the internal memory to add the factor to the measured value and display the spectrum.

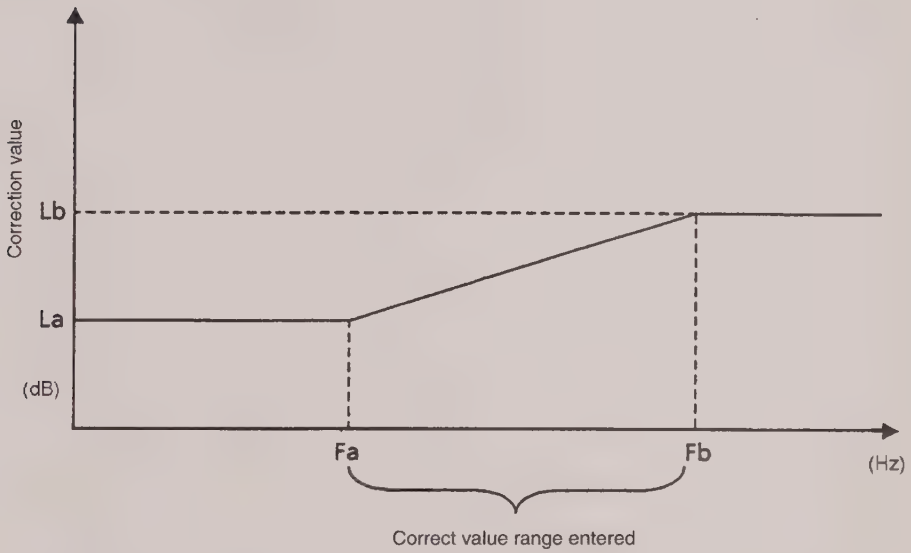
Up to five correction factors (maximum 150 points each) can be stored in the internal memory by storage from an external computer via an external interface. For a more detailed explanation of these methods, refer to the Remote Control part of the separate operation manual.

The following shows the procedure for adding the correction factor to the measured value by using the correction data saved in advance.



Press one of the Corr-1 to Corr-5 keys. The spectrum data is corrected and displayed by the corresponding correction value.

If the frequency range over which the correction values are entered is from Fa to Fb, displayed frequency ranges lower than Fa or higher than Fb have correction values applied as shown in the figure below. The correction value for frequencies lower than Fa is the same as that (La) for Fa and the correction value for frequencies higher than Fb is the same as that (Lb) for Fb.



Notes:

[1] No correction factor is entered at the factory. The correction values are all 0 dB.

[2] The correction value is backed-up by a battery. Therefore, once the value has been entered, it is not lost even after the power is turned off.

[3] The Corr-1 to Corr-5 soft keys allow each menu label to have up to 20 characters. The labels can be entered from the remote control command only. For further details, refer to the Remote Control part of the separate Vol.3 operation manual.

Section 9 System Setting

This section describes the spectrum analyzer system setting method. For the details of Config function, refer to the Vol.1 of the operation manual.

Screen Display Type System Setting 9-4
Date Display type Setting 9-4
Modifying Display Color (Change Color) 9-5
User Definition of Display Color 9-6
Adjusting LCD Brightness 9-7
Setting VGA Out 9-8
Conditions Setting at Power-on 9-8
Setting Date/Time 9-9
Erasing Warm up Message 9-10
"X-out, Z-out" output specification in a zero span sweep 9-10

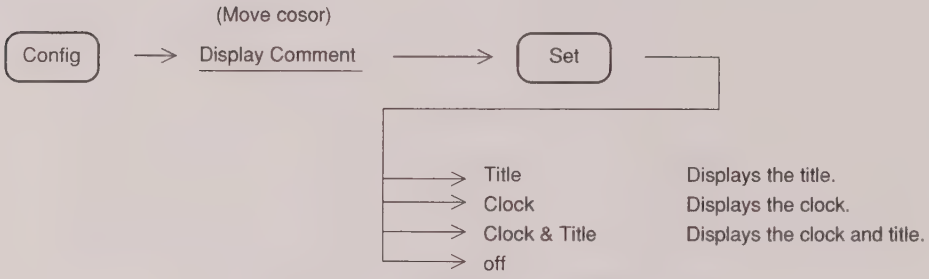
The following system parameters of the spectrum analyzer can be set depending on the usage objective:

- Comments and date display type setting ..... Display
- Screen display color (color pattern) setting ..... Change Color
- Adjusting LCD brightness ..... LCD Brightness
- Setting Date/Time ..... Set Date/Set Time
- Erasing warm up message ..... Erase Warm up Message
- Power on state setting ..... Power On Screen

These system settings are independent from, and are not affected by, the preset function in spectrum analyzer mode.
However, they are included in the Save parameters described in SECTION 10, so the system settings may have changed when recalled.

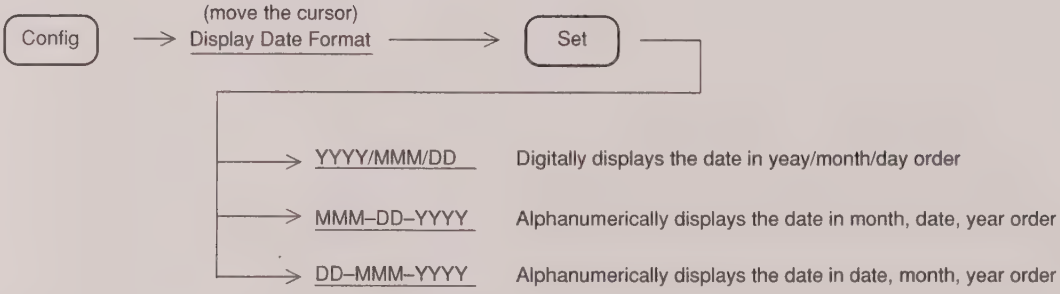
Screen Display Type System Setting

This function selects the title display type and date display type that are displayed on the screen.



Move the cursor on the selected item, press (Set) to confirm.

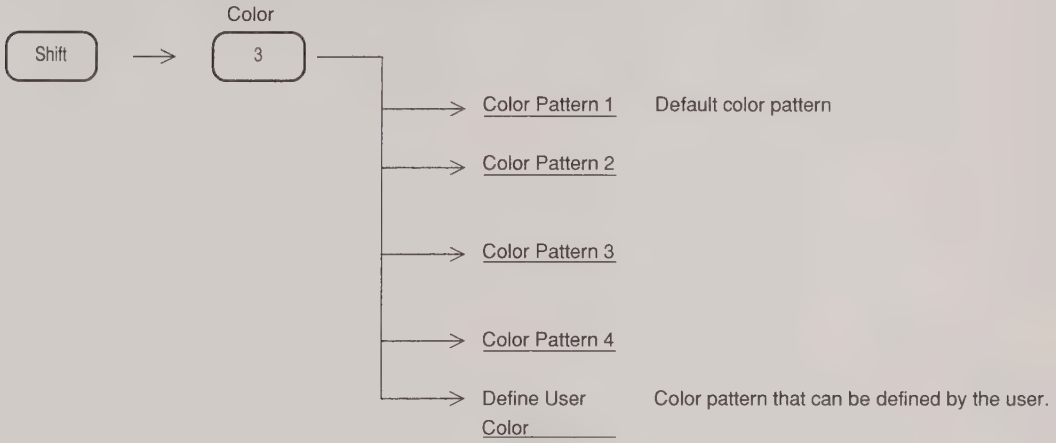
Date Display type Setting



Move the cursor on the selected item, press (Set) to confirm.

Modifying Display Color (Change Color)

This function changes the color of the trace waveform, scale, measurement parameters, menu, and other items displayed on the screen. The color pattern can be selected from among four color patterns, or defined by the user.

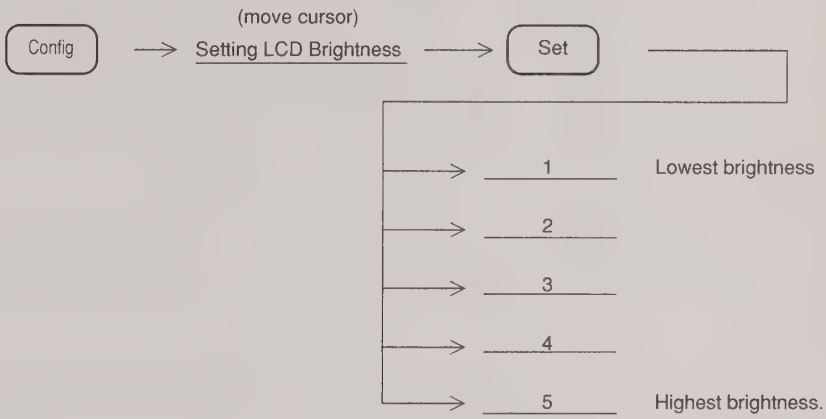


User Definition of Display Color

The MS8608A/MS8609A spectrum analyzer has a color pattern function that allows the user to define the color of the trace waveform, scale, measurement parameters, menu, and other items displayed on the screen.

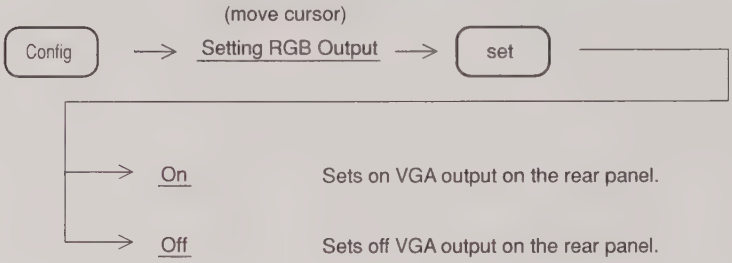
Adjusting LCD Brightness

LCD Brightness can be adjusted by the following key operations.



Setting VGA Out

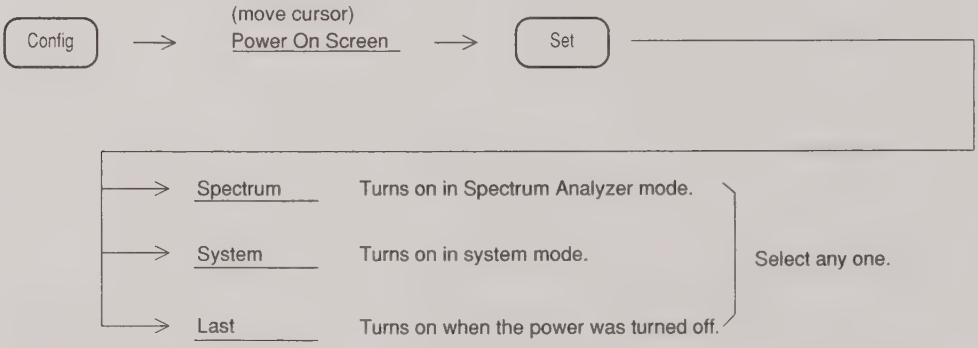
Switching of the Video signal from the Composite Out terminal at the rear panel is carried out by the following key operations.



Move the cursor on the selected item, push (Set) to confirm.

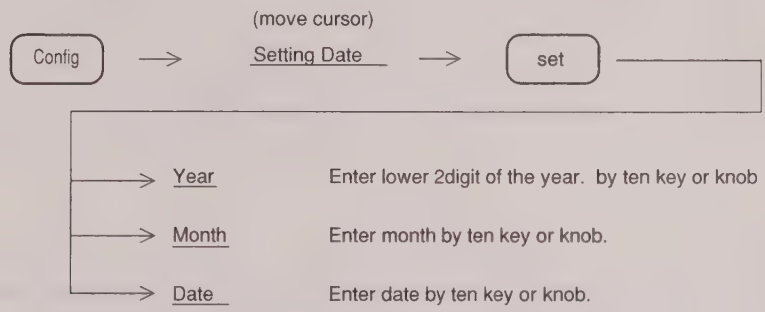
Conditions Setting at Power-on

Set the state of the screen display when the power is turned on by performing the following key operations.



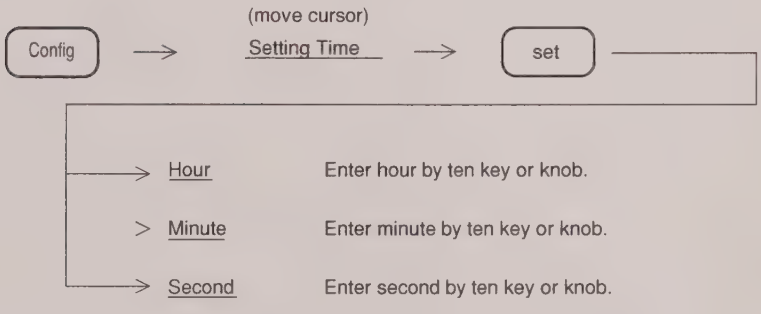
Setting Date/Time

Set the date and time by performing the following key operations.



Note: For an example, when inputting 1st January 2000,

Input Year 0 0 Set
v Month 1 Set
v Day 1 Set .



Note: For an example, when inputting 14:35;10,

Input Hour 1 4 Set
v Minute 3 5 Set
v Second 1 0 Set .

Erasing Warm up Message

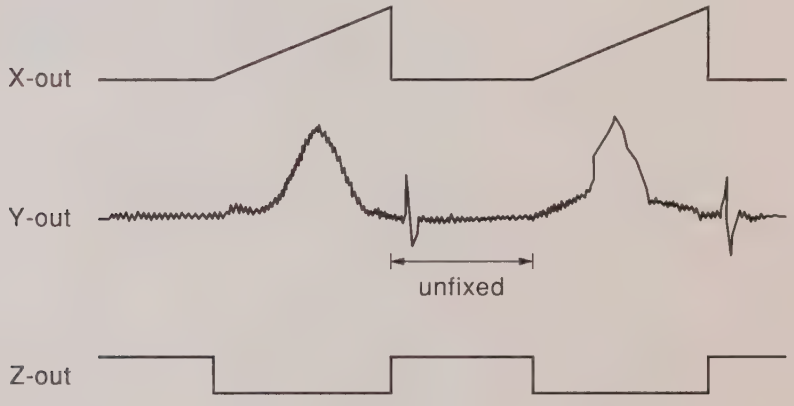
"Warm up" message is indicated on the top right of the display for about 3 minutes after turning on the power. This message can be erased.
(Can be set only on Spectrum screen.)

system ——> Erase Warm up Message

Erases "Warm up" message, forcibly.

"X-out, Z-out" output specification in a zero span sweep

Sweep signal output, image signals of spectrum analyzer can be output and observed by an oscilloscope or the like.
When indicated waveforms are the traces A and B (frequency axes), each signal is output by the following timing.



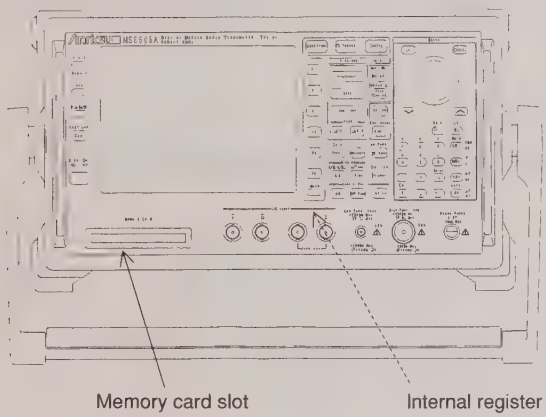
Zero Span Sweep: When trace Time (time axis), normally Y-out only is output, and X-out and Z-out are not output.

Section 10 Save/Recall Function

This section describes saving and recalling of the waveform and parameter data to and from internal register and memory card, respectively.
It also describes memory card file management.on.

Internal Register 10-4
Memory Card 10-4
Saving Parameter and Waveform Data 10-5
Recalling Parameter and Waveform Data 10-7
Selecting Recall Item 10-9
File Deletion and Write Protect 10-10

The spectrum analyzer can save the setting conditions (Parameter) and waveform data (Trace) to internal register and memory card. These data can be recalled and used later.



Internal Register

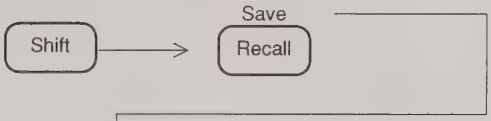
The internal register uses the RAM backed-up by a battery in the spectrum analyzer. Up to 24 parameters and waveform data can be saved. Parameters and waveform data, or parameters only, can be recalled.

Memory Card

The memory card is an interface that corresponds to PCMCIA type I, 1 slots.
Parameters and waveform data can be saved and parameter and waveform data, or parameters only, can be recalled.
Usable card is PC-ATA Flash card only.
Can't use SRAM card etc.

Saving Parameter and Waveform Data

To save the current parameters and waveform data and title to internal register or memory card, perform the following key operations.
When a title is necessary, enter it in advance. (Refer to Section 11.)



Save to Int.Regstr	Saves to internal register. Enter the register No. from the ten keys, then press "Enter" key.
Display Directory /Next	Displays the internal register file No., date, and title directory. When the entire directory cannot be displayed on one screen, press this key again to display the next screen.
Exit Directory View 1	Returns from directroy display screen to waveform display screen.

(Display page 2 of the menu by pressing the More key.)

Save to Mem Card	Saves to memory card. Enter the file No. from the ten keys, then press "Enter" key.
Display Directory /Next	Displays the memory card file No., date, and title directory. When the entire directory cannot be displayed on one screen, press this key again to display the next screen.
Dir Disp Detail Outline	Selects memory card directory detail/outline display by pressing this key.
Save Wave* to CSV File	Saves the waveform data in CSV format.
Exit Directory View	Returns from directroy display screen to waveform display screen.

Note:

Since the Save operation overwrites the data written using the same register/file number, check the directory before doing any saving.

<Memory Directory>

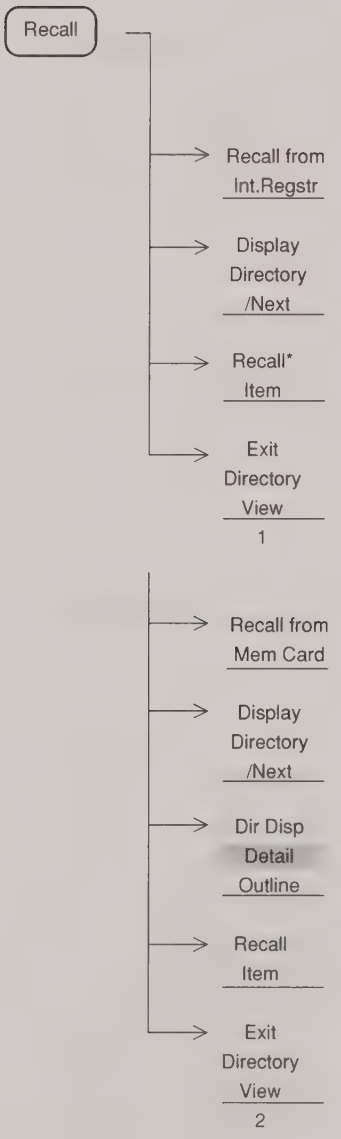
No.	Date	Title
01	2000-09-15	Noise Level Measurement
02	2000-09-23	FALL 0923
10	2000-10-10	SPRT 1010
12	2000-11-03	CLTR

Save Int. Reg. NO=

Internal Register Directory Display Screen

Recalling Parameter and Waveform Data

To recall the saved parameters and waveform data or parameters only from internal register or memory card, perform the following key operations.



Recalls from internal register. Enter the register No. from the ten keys.

Displays the internal register No., date, and title directory. When the entire directory cannot be displayed on one screen, press this key again to display the next screen.

Selects the item to be recalled.

Returns from directroy display screen to waveform display screen.

Recalls from memory card. Enter the file No. from the ten keys.

Displays the memory card file No., date, and title directory. When the entire directory cannot be displayed on one screen, press this key again to display the next screen.

Selects memory card directory detail display/outline display by pressing this key.

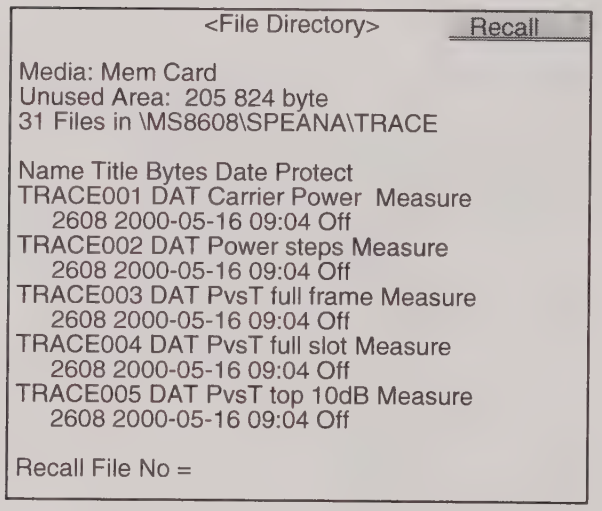
Selects the item to be recalled.

Returns from directroy display screen to waveform display screen.

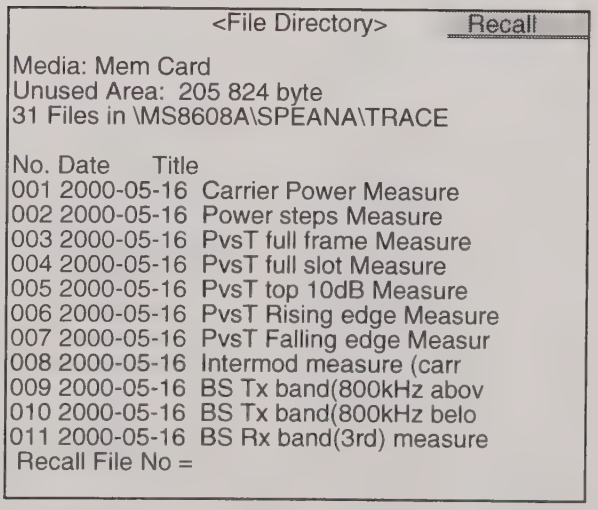
Notes:

[1] Waveform data should be saved in the View storage mode or in the state while stopped after a single sweep. Resweep immediately after recall clears from the screen display the data saves during continuous sweep.

[2] The Cumulative and Overwrite storage modes allow the last-swept waveform data to be saved.


<File Directory>
Recall
Media: Mem Card
Unused Area: 205 824 byte
31 Files in \MS8608\SPEANA\TRACE
Name Title Bytes Date Protect
TRACE001 DAT Carrier Power Measure
2608 2000-05-16 09:04 Off
TRACE002 DAT Power steps Measure
2608 2000-05-16 09:04 Off
TRACE003 DAT PvsT full frame Measure
2608 2000-05-16 09:04 Off
TRACE004 DAT PvsT full slot Measure
2608 2000-05-16 09:04 Off
TRACE005 DAT PvsT top 10dB Measure
2608 2000-05-16 09:04 Off
Recall File No =

(Detail)

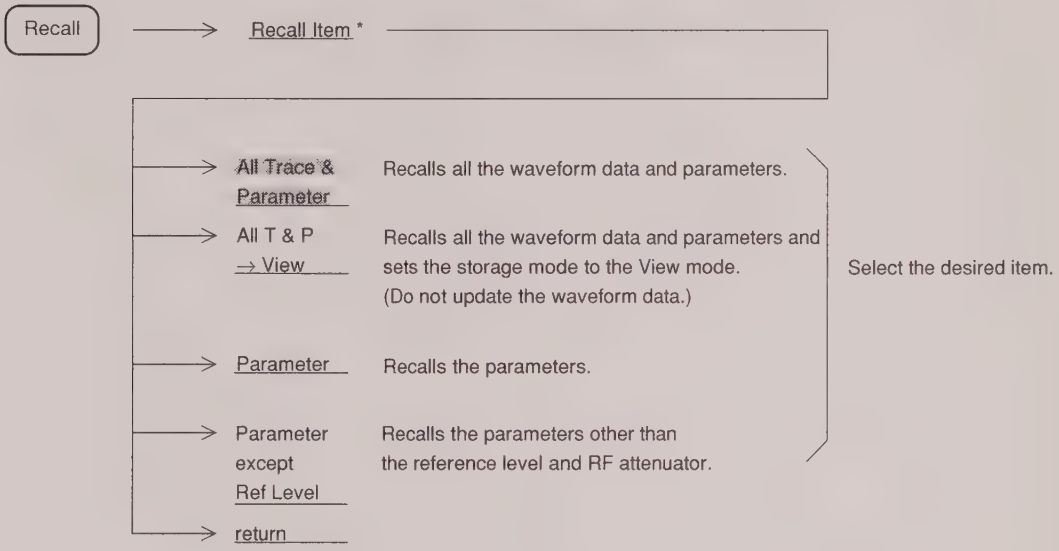

<File Directory>
Recall
Media: Mem Card
Unused Area: 205 824 byte
31 Files in \MS8608A\SPEANA\TRACE
No. Date Title
001 2000-05-16 Carrier Power Measure
002 2000-05-16 Power steps Measure
003 2000-05-16 PvsT full frame Measure
004 2000-05-16 PvsT full slot Measure
005 2000-05-16 PvsT top 10dB Measure
006 2000-05-16 PvsT Rising edge Measure
007 2000-05-16 PvsT Falling edge Measur
008 2000-05-16 Intermod measure (carr
009 2000-05-16 BS Tx band(800kHz abov
010 2000-05-16 BS Tx band(800kHz belo
011 2000-05-16 BS Rx band(3rd) measure
Recall File No =

(Outline)

Memory Card Directory Display Screen

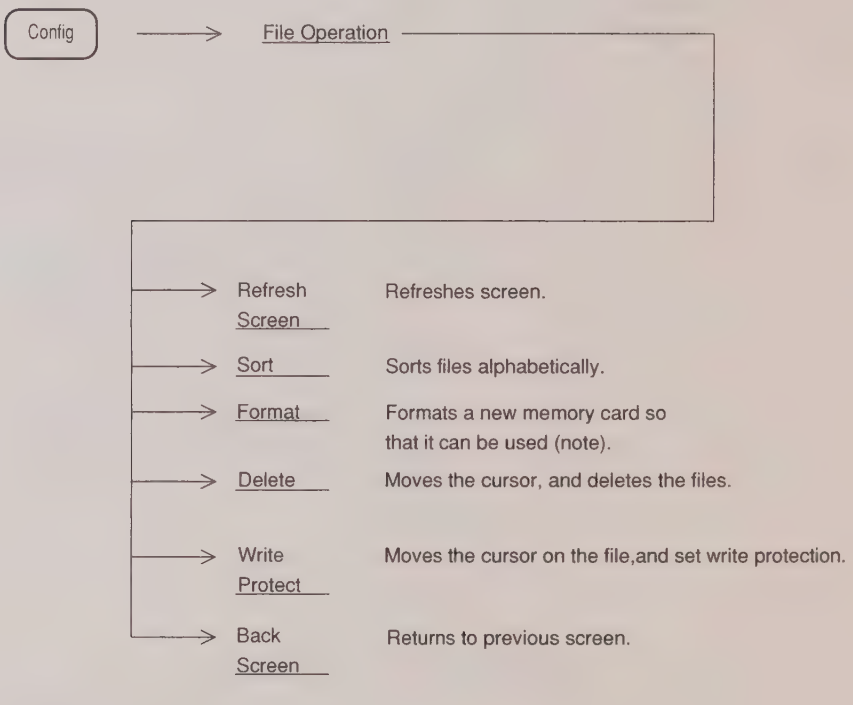
Selecting Recall Item

Select the item to be recalled by performing the following key operations.


Recall
Recall Item *
All Trace & Parameter
Recalls all the waveform data and parameters.
All T & P → View
Recalls all the waveform data and parameters and sets the storage mode to the View mode. (Do not update the waveform data.)
Parameter
Recalls the parameters.
Parameter except Ref Level
Recalls the parameters other than the reference level and RF attenuator.
return
Select the desired item.

File Deletion and Write Protect

To delete a file and set write protect, perform the following key operations.



Note:

1. Changes the directory by following operation.
   - To move the cursor: Turn the knob
   - To turn the page Press the step keys.
   - To change to parent directory Move the cursor to ..(upper line),and press (Set) or (Enter) key.
   - To change to sub directory Move the cursor to the *** dir, and press (Set) or (Enter) key.
2. To remove the write-protection, perform the Write-Protect operation on the already-protected file No., again.
   The write-protected file has "Protect On" at the memory-card directory display, and then can be saved and deleted. When the formatting is performed, the write-protected file is also deleted.

Section 11 Copy

This section describes the COPY function for hard-copying the contents displayed on the screen.

Hard Copying 11-3
- Connecting to Printer 11-3
- Selecting a Printer and BMP File 11-4
- Selecting a Printer 11-5
- Executing Hard Copy 11-6

Saving Screen Image Data to Memory Card 11-7
- Selecting Memory Card 11-7
- Executing Save 11-7
- Displaying the Screen Image Data on PC 11-8

Entering a Title 11-9

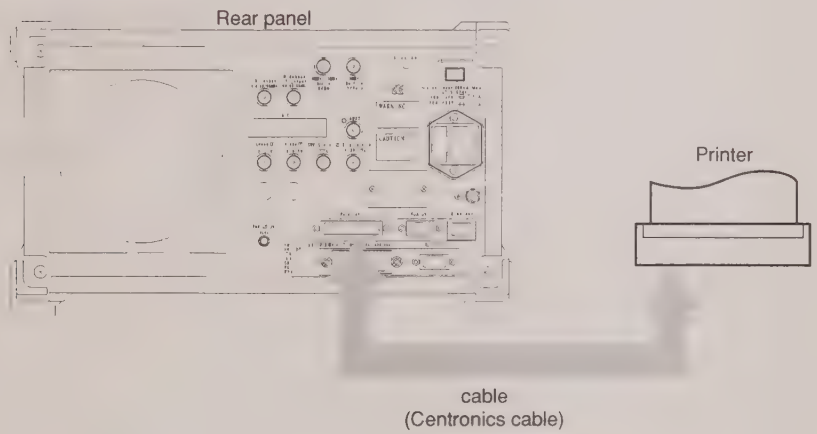
Hard Copying

The spectrum analyzer can output a hard copy of the screen as follows:
Using a printer via parallel interface.

However, the printer is limited to HP815C compatible model and ESC/P compatible types.

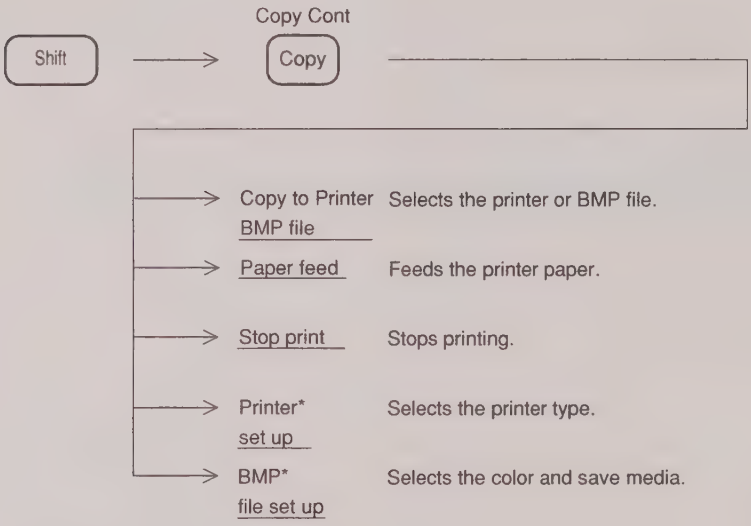
Connecting to Printer

Connect the spectrum analyzer and printer as shown below.



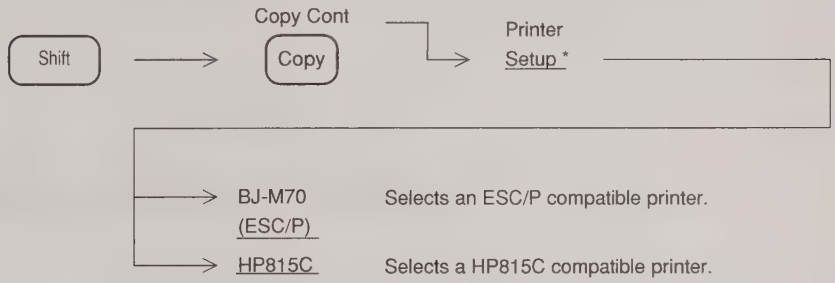
Selecting a Printer and BMP File

To select printer, set-up the printer, feed the paper, stop printing, etc., perform the following key operations.



Selecting a Printer

To select the printer to be used, perform the following key operations.



Executing Hard Copy

Start hard copy by pressing the Copy Cont Copy key. When the screen-image data saving is selected, saves the data to the memory card.

Notes:

- Set the printer or plotter to the ON LINE mode.

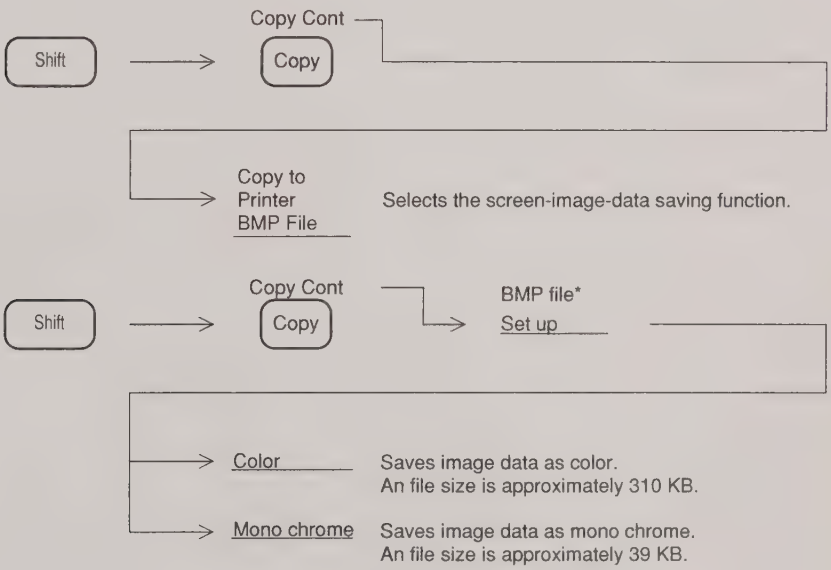
Immediately after setting the copy execution, the sweep stops for a few seconds because of editing process of the data. After restarting the sweep, and beginning the printing at printer/plotter; the parameters etc. can be set. After completion of the current copying, perform the next copying.

Saving Screen Image Data to Memory Card

The screen display contents can be saved to a memory card as a BMP-format (standard image data format of the Windows) file. After saving, the file in the memory card can be opened on the Windows of PC.

Selecting Memory Card

To select the screen-image-data saving function and the memory-card slot at the front panel, perform the following key operations.



Executing Save

Save the screen-image data to a memory card by pressing the Copy Cont Copy key.
File name to be saved is automatically numbered.
When the menu is displayed in this saving mode, it is also saved as it is.
Use the memory card which is formatted by the spectrum analyzer.

Displaying the Screen Image Data on PC

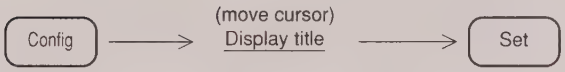
The saved screen image data can be displayed on a personal computer (PC) with a tool on PC (ex. the paint brush of Windows).
The saved files on a memory card are in the directory as shown below.

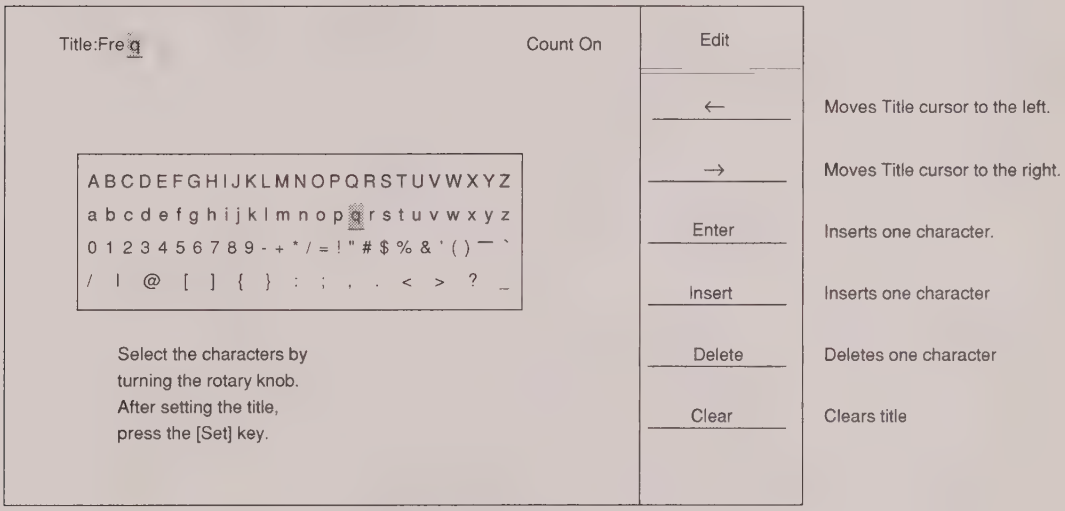
\MS8608A\COPY\COPY001.BMP

File No.

Entering a Title

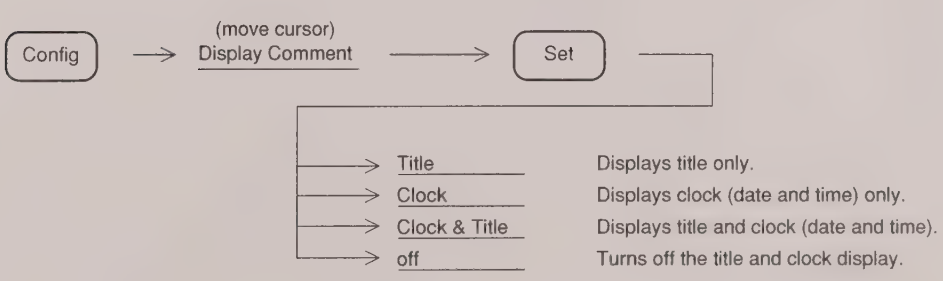
A character string of up to 23 letters can be displayed in the title display field at the top of the screen.
To set a title character string, perform the following key operations.




Title:Fre
Count On
Edit
A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
a b c d e f g h i j k l m n o p q r s t u v w x y z
0 1 2 3 4 5 6 7 8 9 - + * / = ! " # $ % & ' ( ) ¯ `
/ | @ [ ] { } : ; , . < > ? _
Select the characters by turning the rotary knob. After setting the title, press the [Set] key.
←
Moves Title cursor to the left.
→
Moves Title cursor to the right.
Enter
Inserts one character.
Insert
Inserts one character
Delete
Deletes one character
Clear
Clears title

Title Edit Screen

To set the title and clock display mode, perform the following key operations.



Section 12 Measurement

This section describes the Measure key and the operating procedure for actual measurement examples.

Measurement Function 12-3
Frequency Measurement Function 12-4
Measuring Noise Power 12-4
Measuring C/N Ratio 12-5
Channel Power 12-5
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Example of C/N Ratio Measurement 12-9
Example of Power (Noise) Measurement (Frequency Domain, Continuous Wave) 12-12
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Example of Power Measurement (Time Domain) 12-17
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MASK Creation in Frequency Domain Mode 12-40

Measurement Function

Various application measurements can be selected by performing the following key operations.

Measure

- Frequency Count * — Measures the marker frequency at high resolution. Select the resolution from among 1 kHz, 100 Hz, 10 Hz, and 1 Hz.
- Noise * — Measures the absolute value of the total noise power of the zone marker range.
- C/N Ratio * — Measures the carrier signal and noise power ratio.
- Channel * Power — Measures total power with in the zone indicated by zone marker. It is possible to enter an arbitrary calibration value.
- Result * Position — Changes the display position of the measured results.
- Off

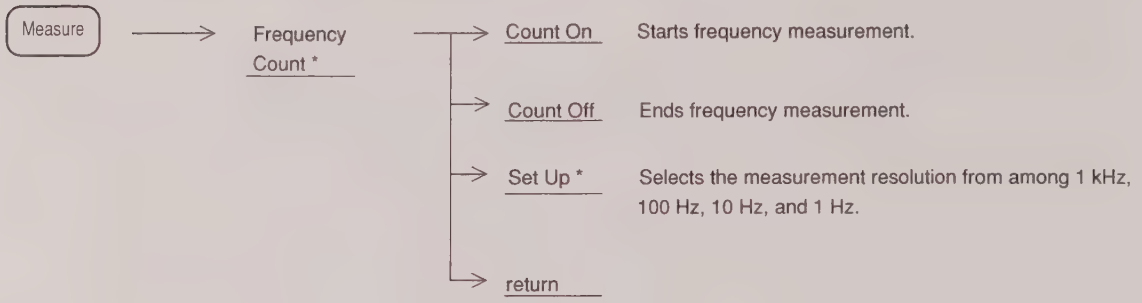
1

- Occupied * Bandwidth — Measures the occupied bandwidth. Select the X dB DOWN mode or N% of POWER mode.
- AdJ ch pwr * — Measures the adjacent channel leakage power. Select the channel separation, channel bandwidth, measurement mode, ACP graph display On/Off, channel center line On/Off, channel BW line On/Off, and measurement low band/high band/both bands channel, etc.
- Burst * AvgPower — Measures the average power of a burst signal in the time domain. Select
- Mask * — Sets the frequency domain standard line and judge quality relative to the standard. Select the mask table, mask movement, measurement mode, mask table creation, mask table load/save, etc.
- Time Template * — Sets the time domain standard line and judge quality relative to the standard. Selects the template table, template movement, measurement mode, table creation, table load/save, etc.
- Off

2

Frequency Measurement Function

To measure the marker frequency at high resolution, perform the following key operations.

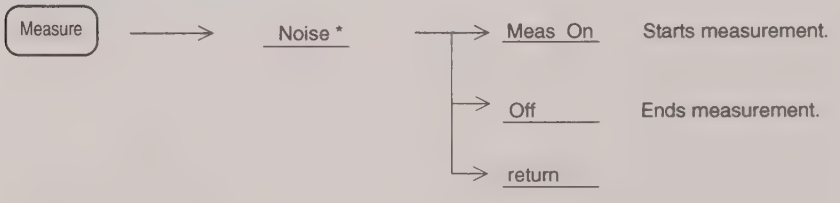


Note:

- If the RBW is too small compared to frequency span, it takes more times to count because of the internal automatic tuning operation.
  Conversely, if the RBW is too large and another signal exists near the measurement signal (within the 20 multiple of the RBW), the automatic operation may catch it. So, select the appropriate RBW value.
- In the following cases, the frequency may not be counted correctly because of the undesired adjacent noise.
  [1] Signal level is less than –30 dB from reference level.
  [2] Level difference between signal and noise is less than 20 dB.
- This cannot be used with Option 04: Digital RBW.

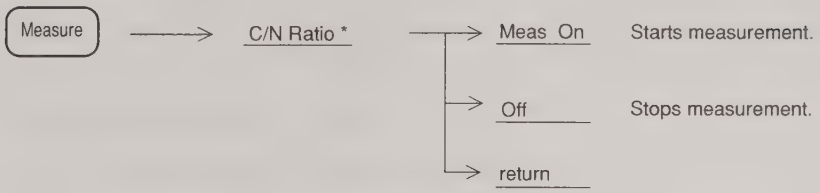
Measuring Noise Power

To measure the total noise power of the zone marker range, perform the following key operations.



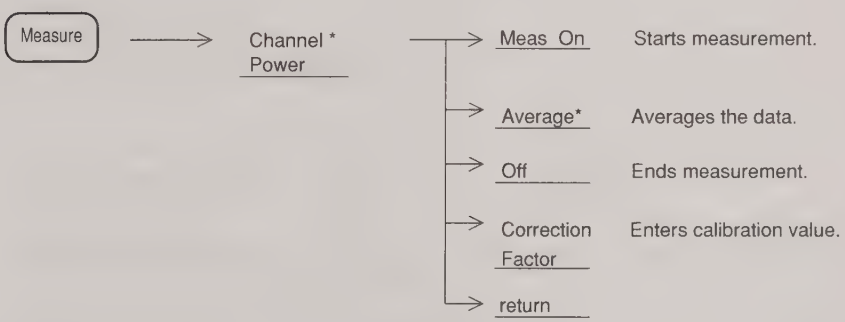
Measuring C/N Ratio

To measure the C/N ratio, perform the following key operations.



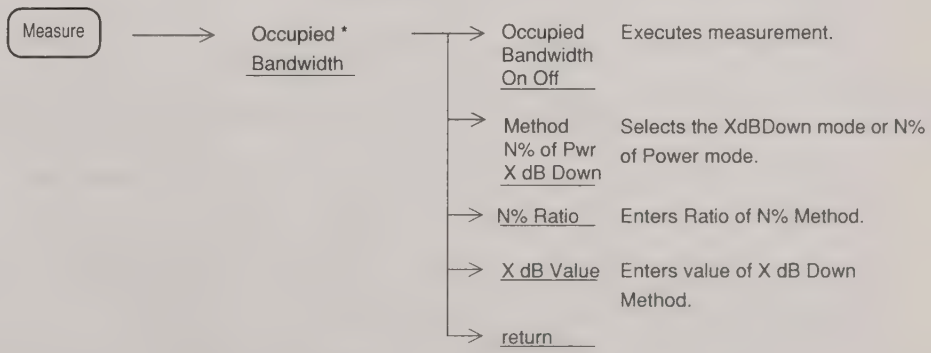
Channel Power

Total power with in the channel specified by zone marker is measured.
It is possible to set an arbitrary calibration value.



Measuring Occupied Bandwidth

To measure the occupied bandwidth, perform the following key operations.


Measure
Occupied * Bandwidth
Occupied Bandwidth On Off
Executes measurement.
Method N% of Pwr X dB Down
Selects the XdBDown mode or N% of Power mode.
N% Ratio
Enters Ratio of N% Method.
X dB Value
Enters value of X dB Down Method.
return

Measuring Adjacent Channel Leakage Power

To measure the adjacent channel leakage power, perform the following key operations.

Measure → Adj ch pwr *

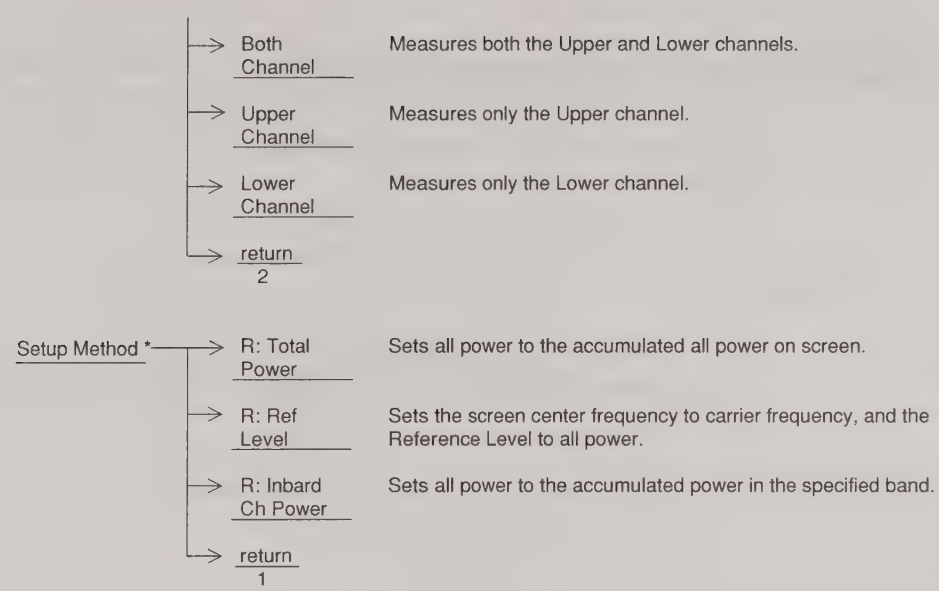
Adj Ch Pwr Measure On Off	Performs measurement.
Setup Freq *	Sets the frequency relations.
Setup Graph *	Sets the graph relations.
Setup Method *	Sets the measurement method relations.
return 1	
ACP Center Center Freq Marker	Selects the center frequency of adjacent channel.
Channel Count 2CH 3CH	Sets 2 channels or 3 channels for measured results display.
return 2	

Setup Freq *

Ch Sepa-1 12.50 kHz	Sets the channel separation 1.
Ch Sepa-2 25.00 kHz	Sets the channel separation 2.
Ch Sepa-3 50.00 kHz	Sets the channel separation 3.
Ch BW 8.50 kHz	Sets the band width of channel.
Inband Ch BW 8.50 kHz	Sets the bandwidth of adjacent channel for In Band.
return 1	

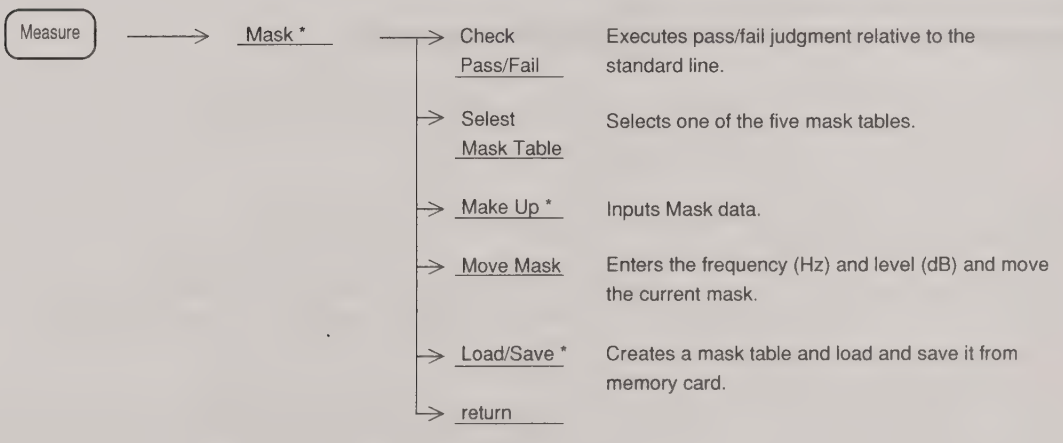
Setup Graph *

ACP Graph On Off	Sets all power to the accumulated all power on screen.
Ch Center Line On Off	Displays the channel center frequency by a line.
Ch BW Line On Off	Displays the channel width by a line.
Inband Ch BW Line On Off	Displays the channel width within In Band by a line.
return 1	


Both Channel
Measures both the Upper and Lower channels.
Upper Channel
Measures only the Upper channel.
Lower Channel
Measures only the Lower channel.
return
2
Setup Method *
R: Total Power
Sets all power to the accumulated all power on screen.
R: Ref Level
Sets the screen center frequency to carrier frequency, and the Reference Level to all power.
R: Inbard Ch Power
Sets all power to the accumulated power in the specified band.
return
1

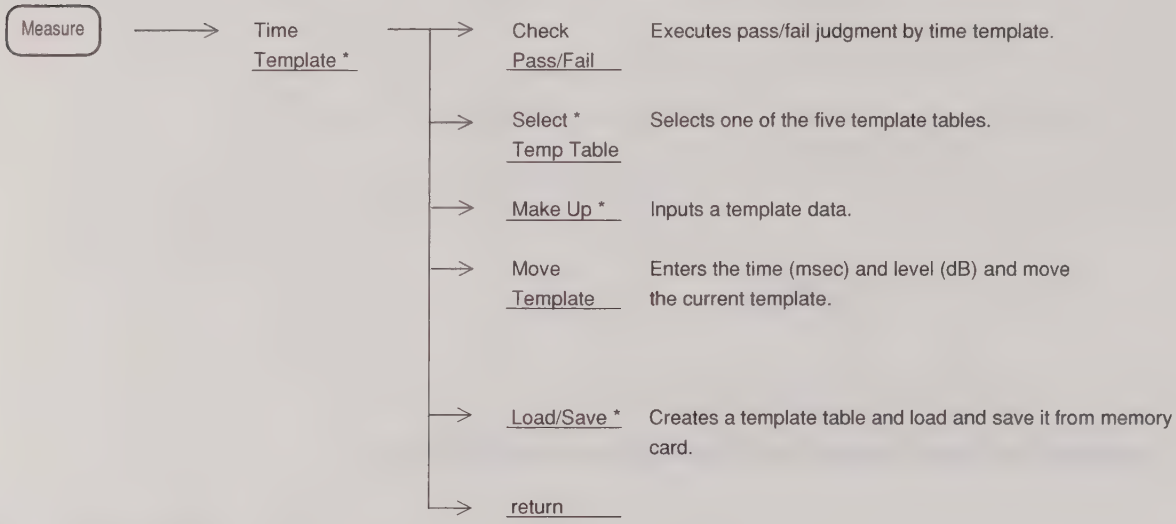
Pass/Fail Judgment by Mask

To perform pass/fail judgment relative to the frequency domain standard line (mask), perform the following key operations.


Measure
Mask *
Check Pass/Fail
Executes pass/fail judgment relative to the standard line.
Selest Mask Table
Selects one of the five mask tables.
Make Up *
Inputs Mask data.
Move Mask
Enters the frequency (Hz) and level (dB) and move the current mask.
Load/Save *
Creates a mask table and load and save it from memory card.
return

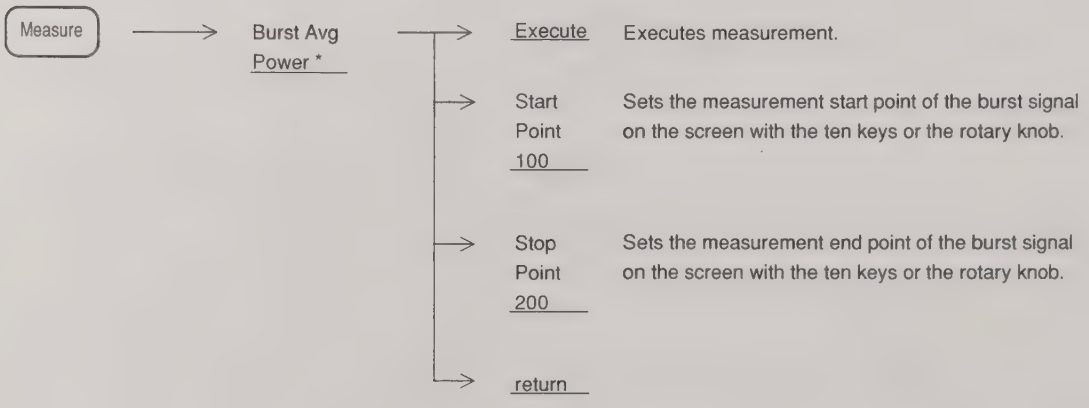
Pass/Fail Judgment by Time Template

To perform pass/fail judgment by time domain template, perform the following key operations.


Measure
Time Template *
Check Pass/Fail
Executes pass/fail judgment by time template.
Select * Temp Table
Selects one of the five template tables.
Make Up *
Inputs a template data.
Move Template
Enters the time (msec) and level (dB) and move the current template.
Load/Save *
Creates a template table and load and save it from memory card.
return

Measuring Burst Average Power

To measure the average power of a burst wave in the time domain mode, perform the following key operations.


Measure
Burst Avg Power *
Execute
Executes measurement.
Start Point 100
Sets the measurement start point of the burst signal on the screen with the ten keys or the rotary knob.
Stop Point 200
Sets the measurement end point of the burst signal on the screen with the ten keys or the rotary knob.
return

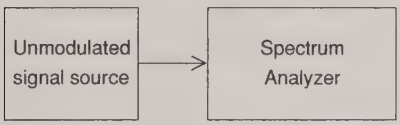
Measurement Examples

The following describes the measurement block diagram and measurement operating procedure of actual measurement examples.
In the measurement examples, [ ] indicates a panel key and F*: << >> indicates a soft key.

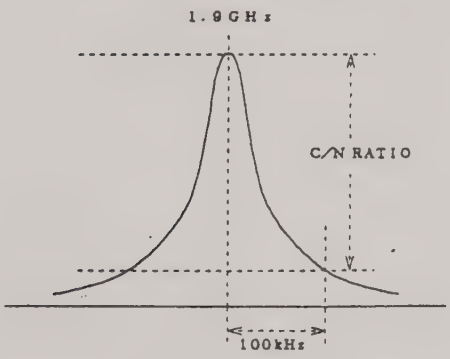
Example of C/N Ratio Measurement

- In C/N measurement, set the detection mode set to the Sample mode, unless specified otherwise.
  (Pressing [A,B] until F1: <<Trace A>> is displayed, then set the mode by pressing F1: <<Trace A>>, F6: <<Detection>>, and F3: <<Sample>>.)

(1) Measurement block diagram



- Center frequency : 1.9 GHz
- Offset frequency : 100 kHz



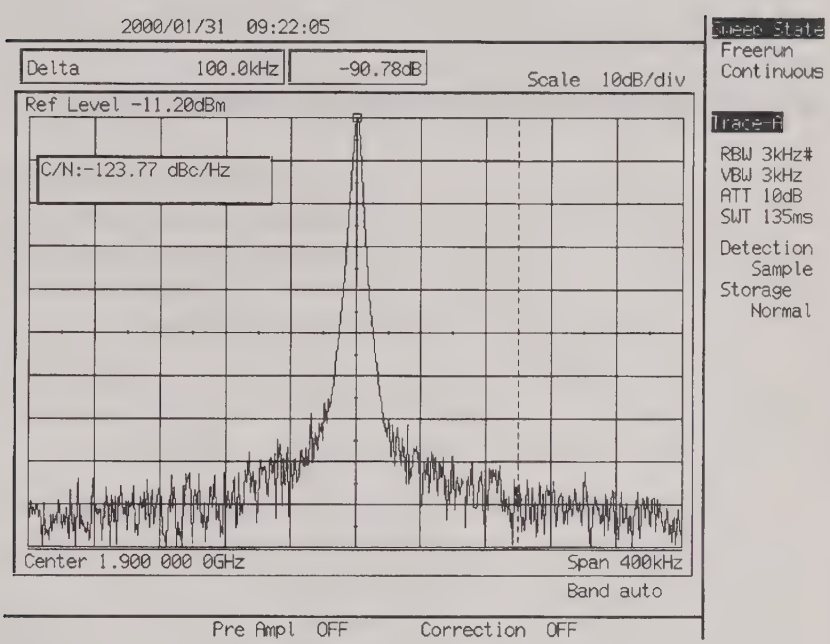
(2) Measurement procedure

Step	Procedure
1	[Preset], F1: <<Preset All>>
2	Span frequency setting : [Span], [4]m [0], [0], [kHz] Set to 3 or 4 times the offset frequency. (Here, the span frequency was set to 400 kHz.)
3	Reference level setting : [Amplitude], [2], [0], [dBm]
4	Center frequency setting: [Frequency], [1], [.], [9], [GHz]
5	RBW setting : [BW], F: <<RBW Manual>> [3], [kHz]
6	Marker setting : [Marker], F5: <<Zone Width>>, F1: <<Spot>>
7	Peak (frequency, level) setting: After 1 sweep, press [→CF] and [→RLV].
8	Marker position setting : [Marker], F2: <<Delta Marker>>, [1], [0], [0], [kHz] (Becomes the offset frequency.)
9	C/N ratio measurement: : Press [Measure] until F3: <<C/N Ratio Measure>> is displayed, then press F3: <<C/N Ratio Measure>> and F1: <<Meas On>>. Each time sweep is refreshed, the measurement result is displayed at the upper left-hand corner of the screen.

★ Measurement result example: –123.77 dBc/Hz

★ When wanting to change the offset frequency and make measurement: Press [Marker], then set the offset frequency with the rotary knob or ten keys.

★ Change the RBW value and select the best C/N measurement value. Also make the ATT value minimum.



Example of C/N Ratio Measurement

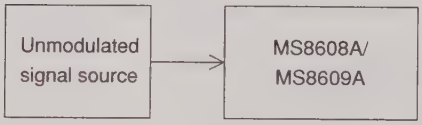
Note:

- When the marker frequency is moved at the reference marker point (peak point of the carrier signal), the measurement result does not become 0 dB. This is because the carrier signal (on which the reference marker is positioned) is considered as a noise, and the detector adds the correction value to the carrier.

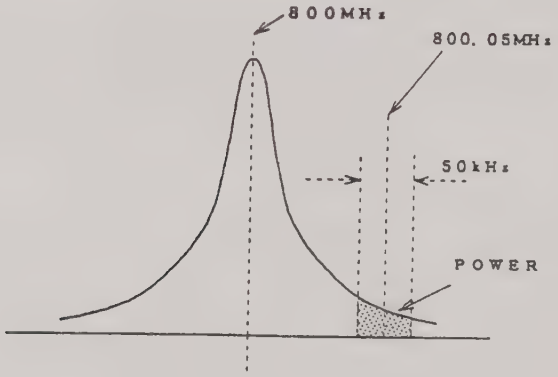
Example of Power (Noise) Measurement (Frequency Domain, Continuous Wave)

- When making power measurements, set the detection mode to the Sample mode, unless specified otherwise.
  When measuring the carrier-off leakage power and adjacent channel leakage power of Japan digital cordless telephone systems (burst wave), set the detection mode to the Pos Peak mode.

(1) Measurement block diagram



- Center frequency : 800 MHz
- Span frequency width : 400 kHz
- Measurement center frequency : 800.05 MHz
- Measurement frequency bandwidth : 50 kHz



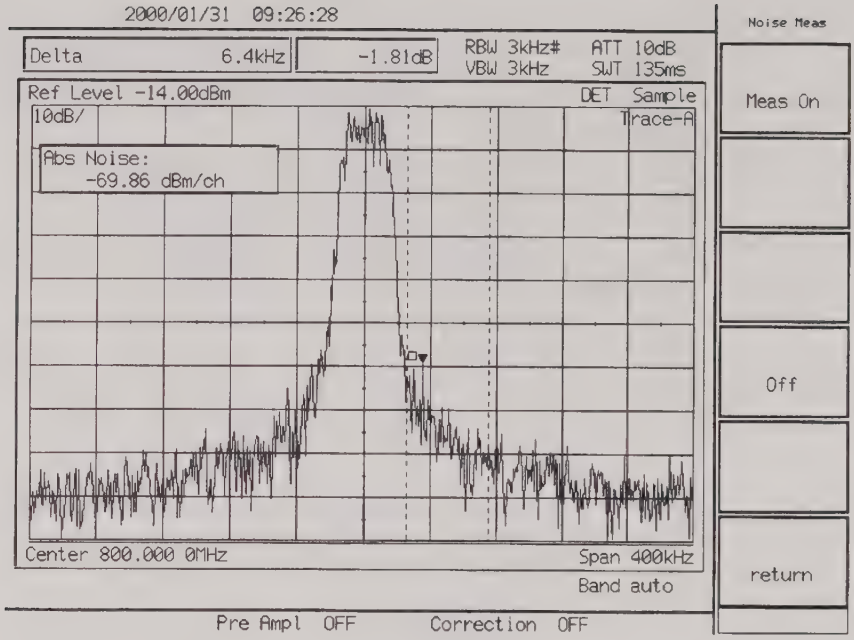
(2) Measurement procedure

Step	Procedure
1	[Preset], F1: <<Preset All>>
2	Span frequency setting : [Span], [4], [0], [0], [kHz]
3	Reference level setting : [Amplitude], [2], [0], [dBm]
4	Center frequency setting : [Frequency], [8], [0], [0], [MHz]
5	RBW setting : [BW], F1: <<RBW Manual>>, [3], [kHz]
6	Peak (frequency, level) setting: After 1 sweep, press [→CF] and [→RLV].
7	Zone center position setting : [Marker], F5: <<Zone Width>>, F1: <<Spot>>, [Marker], F1: <<Normal Marker>>, [8], [0], [0], [.], [0], [5], [MHz]
8	Zone marker width setting : [Marker], F5: <<Zone Width>>, [5], [0], [kHz]
9	Measure power (noise) : Press [Measure] until F2<< Noise Measurement>> is displayed, then press F2: <<Noise Measure>> and F1; <<Meas On>>. Each time sweep is refreshed, the total power value of the zone marker range (measured value) is displayed at the upper left-hand corner of the screen.

★ Measurement result example: –69.86 dBm/ch

★ When wanting to change the zone marker position and make measurements: After pressing [Marker], set the position (frequency) with the rotary knob and ten keys.

★ Applications: *Carrier-off leakage power (PHS) measurement
*Adjacent channel leakage power (PHS) measurement

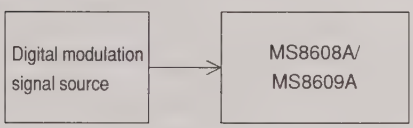


Example of Power (Noise) Measurement

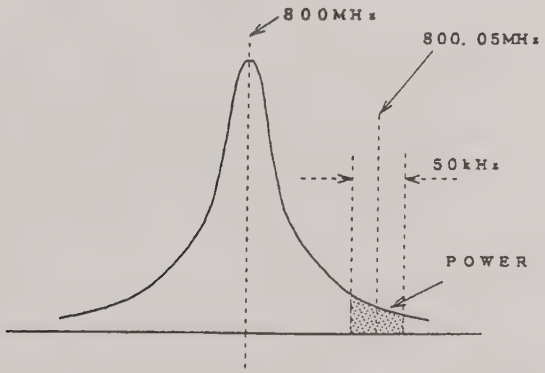
Example of Channel Power Measurement (Frequency Domain, Continuous Wave)

- When making power measurements, set the detection mode to the Sample mode, unless specified otherwise.
  When measuring the carrier-off leakage power and adjacent channel leakage power of Japan PHS systems (burst wave), set the detection mode to the Pos Peak mode.

(1) Measurement block diagram



- Center frequency : 800 MHz
- Span frequency width : 400 kHz
- Measurement center frequency : 800.05 MHz
- Measurement frequency bandwidth : 50 kHz



(2) Measurement procedure

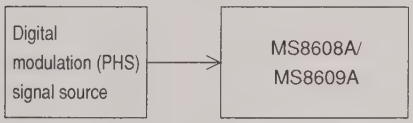
Step	Procedure
1	[Preset], F1: <<Preset All>>
2	Span frequency setting : [Span], [4], [0], [0], [kHz]
3	Reference level setting : [Amplitude], [2], [0], [dBm]
4	Center frequency setting : [Frequency], [8], [0], [0], [MHz]
5	RBW setting : [BW], F1: <<RBW Manual>>, [3], [kHz]
6	Peak (frequency, level) setting: After 1 sweep, press [→CF] and [→RLV].
7	Zone center position setting : [Marker], F5: <<Zone Width>>, F1: <<Spot>>, [Marker], F1: <<Normal Marker>>, [8], [0], [0], [.], [0], [5], [MHz]
8	Zone marker width setting : [Marker], F5: <<Zone Width>>, [5], [0], [kHz]
9	Measure Channel Power : Press [Measure] until F4 << Channel Power measure>> is displayed, then press F4: <<Noise Measure>> and F1; <<Meas On>>. Each time sweep is refreshed, the total power value of the zone marker range (measured value) is displayed at the upper left-hand corner of the screen. F5: <<correction factor>>, an arbitrary calibration value can be entered.

★ When wanting to change the zone marker position and make measurements: After pressing [Marker], set the position (frequency) with the rotary knob and ten keys.

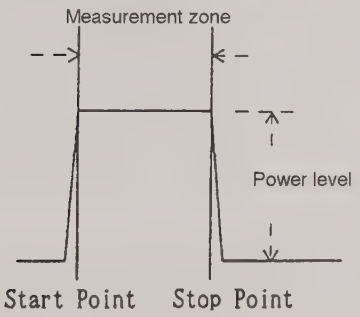
Example of Power Measurement (Time Domain)

- Find the effective average value of the zone set by the two cursors on the screen.

(1) Measurement block diagram



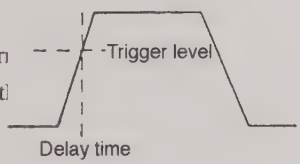
- Center frequency : 1.9 GHz
- Time span : 1 ms



(2) Measurement procedure

Step	Procedure	
1	[Preset], F1: <<All>>.	
2	Time domain	: [Time] or [Span], [0], [Hz]
3	Reference level setting	: [Amplitude], [2], [0], [dBm]
4	Center frequency setting	: [Frequency], [1], [.], [9], [GHz]
5	RBW setting	: [BW], F1: <<RBW Manual>>, [1], [MHz]
6	VBW setting	: [BW], F1: <<VBW Manual>>, [1], [MHz]
7	Time span setting	: [Time], F2: <<Time Span>>, [5], [msec]
8	Reference level setting	: After one sweep, press [→RLV] and [Amplitude] and raise the reference level about 3 dB with the rotary knob.
9	Time span setting	: [Time], F2: <<Time Span>>, [1], [msec]

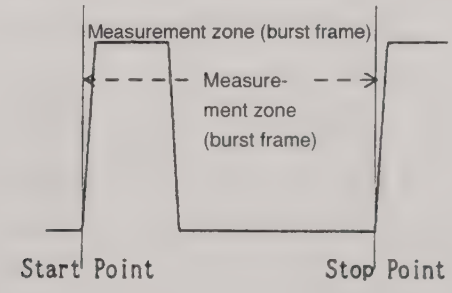
Step		Procedure
10	Trigger setting	: Select Triggered with [Trig/Gate], F1: <<Triggered>>. F2: <<Trigger Source>>, F1: <<Video>> (Apply video trigger) Select rise with F5: <<Trig Slope>>. Press F1: <<Trig Level>>, then set the trigger level with the rotary knob.
11	Time delay setting	: Press [Trig/Gate], F5: <<Delay Time>>, then set the signal waveform to the left of center of the screen with the rotary knob.
12	Single sweep	: [Single]
13	Measurement preparation	: Press [Measure] until F3: <<Burst Avg Power>> is displayed, then press F3: <<Burst Avg Power>>.
	Measurement zone setting	: Press F3: <<Start Point>>, then set the measurement zone start position with the rotary knob. Press F4: <<Stop Point>>, then set the measurement zone stop position with the rotary knob.
14	Power measurement	: F1: <<Execute>>. The measured value is displayed at the top left-hand corner of the screen.

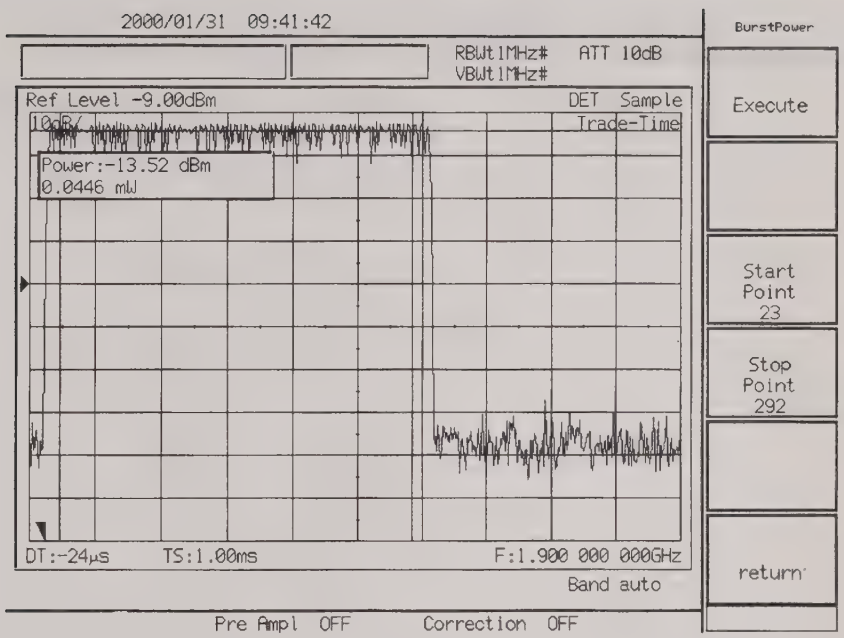


★ Example of measurement result: –13.52 dBm, 44.6 μW

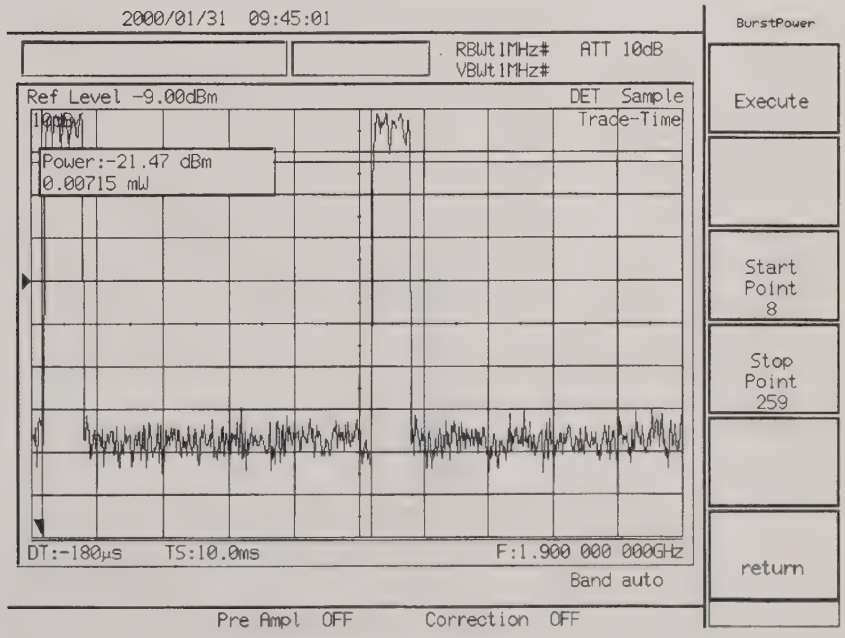
★ When finding the average power between burst frames, measurement should be performed by setting the measurement zone to the burst frame time.

★ Applications: * Spurious radiation strength measurement (PDC, PHS)
* Antenna power measurement (PDC, PHS)





Power Measurement (Time Domain) Example 1

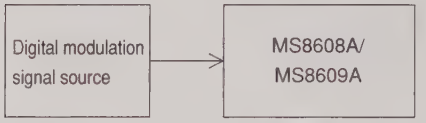


Power Measurement (Time Domain) Example 2

Example of Time Domain Peak Detection

- The time domain detection mode is initially set to the sample detection mode. When the time axis sweep time was set to more than 10 ms, the positive peak detection mode can be selected.

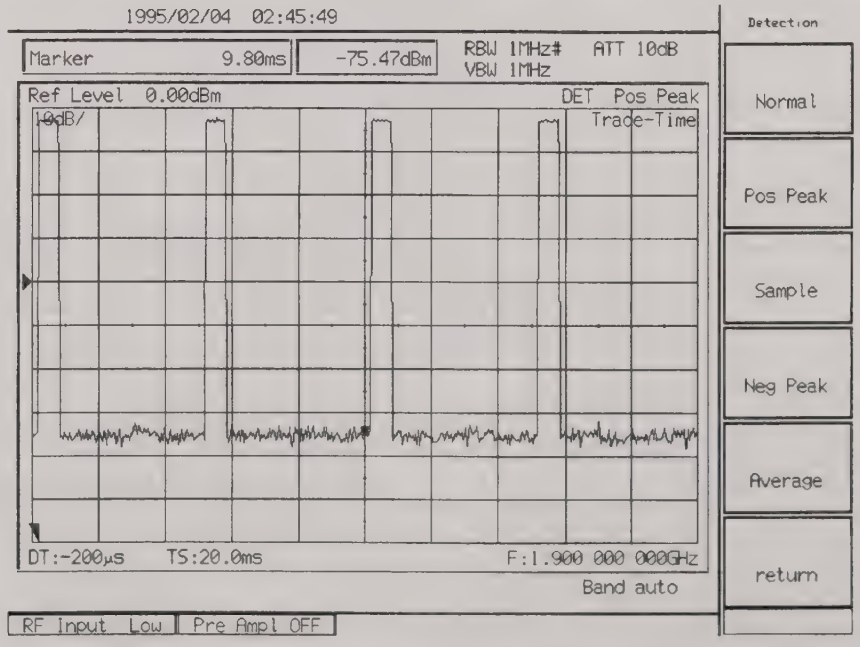
(1) Measurement block diagram



- Center frequency : 1.9 GHz
- Time span : 20 ms

(2) Measurement procedure

Step	Procedure
1	Set in accordance with steps 1 to 9 of the power measurement procedure of paragraph 5 Power Measurement (Time Domain). Set <<Time Span>> of step 7 to 20 ms.
2	DET MODE menu display : Press [Time] until F6: <<Detection>> is displayed. Select F6: <<Detection>>, F2: <<Pos Peak>>.

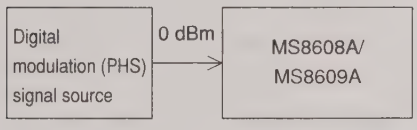


Example of Positive Peak Detection Mode

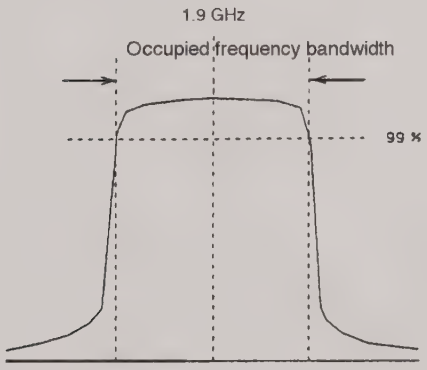
Example for Occupied Frequency Bandwidth (Burst Wave)

- For burst waves, set the detection mode to the Pos Peak mode.

(1) Measurement block diagram



- Center frequency : 1.9 GHz
- Span frequency width : 800 kHz
- RBW : 1 kHz
- VBW : 1 kHz
- Sweep time : 3 s



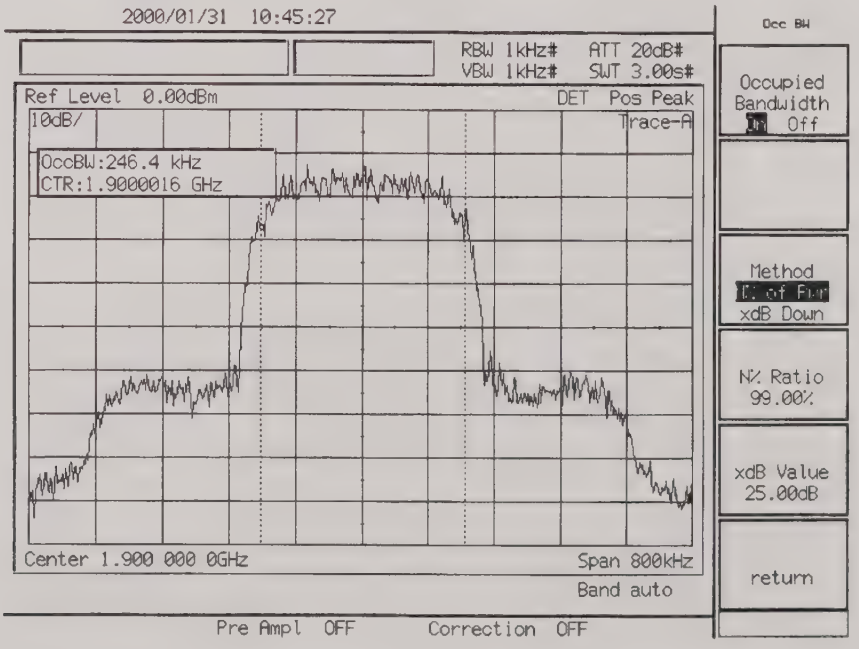
(2) Measurement procedure

Span		Procudere
1	Preset	: [Preset], F1: <<Preset All>>
2	Span frequency setting	: [Span], [8], [0], [0], [kHz]
3	Reference level setting	: [Amplitude], [0], [dBm]
4	Center frequency setting	: [Frequency], [1], [.], [9], [GHz]
5	RBW setting	: [BW], F1: <<RBW Manual>>, [1], [kHz]
6	VBW setting	: [BW], F2: <<VBW Manual>>, [1], [kHz]

Span	Procudere	
7	Sweep time setting	: [Sweep Time], [3], [s]
8	Single sweep	: [Single]
9	Measurement preparation	: Press [Measure] until F1: <<Occupied Bandwidth>> is displayed, then press F1: <<Occupied Bandwidth On>>.
10	99% method setting	: Select N% of Pwr with F3: <<Method N% of Pwr>>. F4: <<N% Ratio>>, [9], [9], [Enter]
11	Occupied frequency bandwidth method: The measured value is displayed at the top left-hand corner of the screen.	

★ Example of measurement result: OccBW: 246.4 kHz, CTR: 1.9000016 GHz

★ Application: Occupied frequency bandwidth (PDC, PHS, etc.)

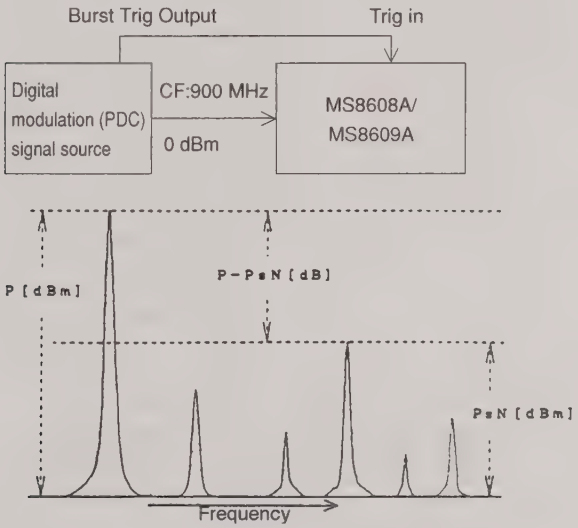


Example of Occupied Frequency Bandwidth Measurement

Example of Spurious Radiation Strength Measurement (Burst Wave)

- For burst waves, set the detection mode to the Pos Peak mode.

(1) Measurement block diagram



Detection:

- Sweep frequency range : 10 MHz to 3 GHz
- RBW : 1 MHz
- VBW : 1 MHz
- Sweep time : 60 s

Power measurement:

- Span frequency width : 0 Hz
- RBW : 100 kHz
- VBW : 10 kHz
- Sweep time : 20 ms

(2) Measurement procedure

Step	Procedure
	(A) Spurious detection
1	[Preset], F1: <<Preset All>>.
2	Sweep frequency range setting : [Frequency], F3: <<Start Freq>>, [1], [0], [MHz], F3: <<Stop Freq>>, [3], [GHz]
3	Reference level setting : [Amplitude], [5], [dBm]
4	RBW setting : [BW], F1: <<RBW Manual>>, [1], [MHz]
5	VBW setting : [BW], F2: <<VBW Manual>>, [1], [MHz]
6	Sweep time setting : [Sweep Time], [6], [0], [s]
7	Single sweep : [Single]
8	Multimarker setting : [Shift], [Marker] (Multi Mkr), F2: <<Highest 10>>, F5: <<Marker List>>. Main and spurious lists (frequency and level of each) are displayed.
	(B) Spuripus radiation strength measurement (Example: Assume that the frequency obtained from the list is 1.8 GHz.)
9	Time domain: [Marker], F3: <<Marker Off>>, [Time] The following measures the power by the same procedure as power measurement (time domain).
10	Center frequency setting : [Frequency], [1], [.], [8], [GHz]
11	RBW setting : [BW], F1: <<RBW Manual>>, [1], [0], [0], [kHz]
12	VBW setting : [BW], F2: <<VBW Manual>>, [1], [0], [kHz]
13	Press pressing : [Time] until F2: <<Time Span>> is displayed, then press F2: <<Time Span>>, [2], [0], [ms].
14	Trigger setting : Select Triggered with [Trig/Gate], F1: <<Triggered>>. Select Rise with F2: <<Trigger Slope>>, F3: <<External>>, F1: <<–10 to 10V>>, F5: <<Trig Slope>>. F4: <<Trig Level>>, [2], [V]
15	Press : [Trig/Gate], F5: <<Delay Time>>, then set Delay Time with the rotary knob so that the signal waveform moves to the left of center of the screen.
16	Single sweep : [Single]

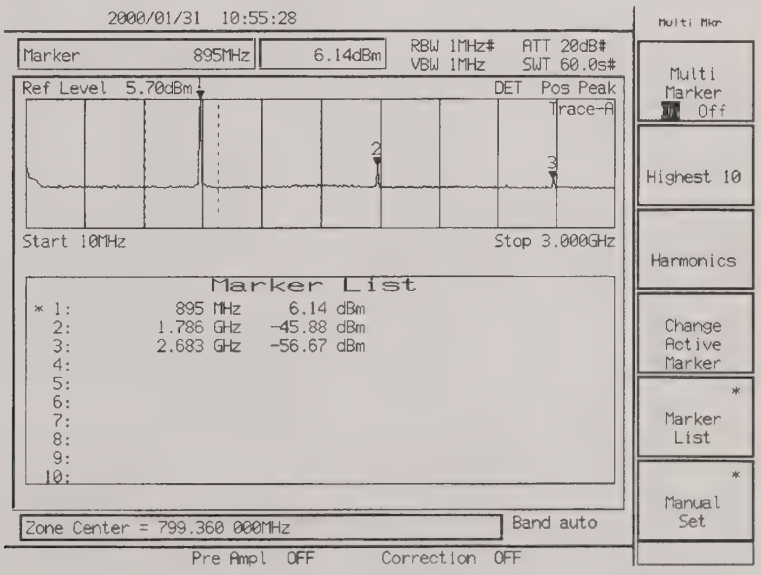
Step	Procedure
17	Measurement preparation : Press [Measure] until F3: <<Burst Avg Power>> is displayed, then press F3: <<Burst Avg Power>>.
18	Measurement zone setting : Press F3: <<Start Point>>, then set the measurement zone start position with the rotary knob. Press F4: <<Stop Point>>, then set the measurement zone stop position with the rotary knob.
19	Power measurement : F1: <<Execute>>. The measured value (P_{SN}) is displayed at the top left-hand corner of the screen.

★ Example of measurement result: –50.96 dBm, 0.00000802 mW

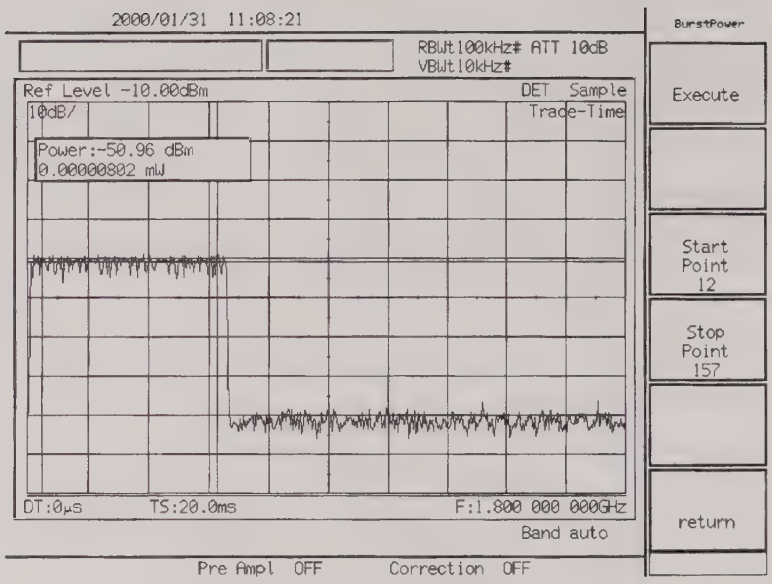
(C) Spurious ratio strength ratio (relative to carrier power)

20 Set the center frequency to the carrier frequency and measure the carrier power (P) by executing steps 15, 16, 17, and 18.

Spurious radiation strength ratio: $(P_{SN}) - (P)$ [dB]



Example of Spurious Detection



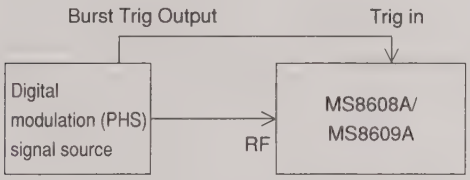
Example of Spurious Strength measurement

Examples of Carrier-Off Leakage Power Measurement (Time Gate Spectrum Analysis)

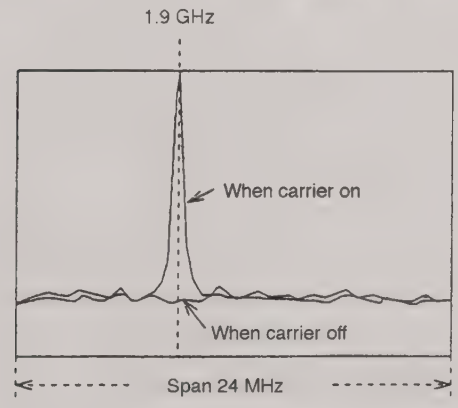
Example 1 When external trigger used

- Set the detection mode to the Pos Peak mode.

(1) Measurement block diagram

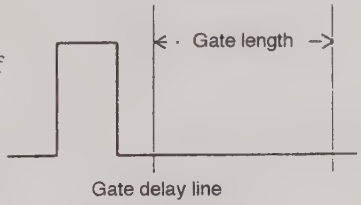


- Input signal frequency : 1.9 GHz
- Center frequency : 1906.55 MHz
- Span frequency width : 24 MHz
- RBW : 300 kHz
- VBW : 3 MHz
- Sweep time : 4 s



(2) Measurement procedure

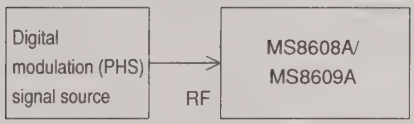
Step	Procedure
1	[Preset], F1: <<Preset All>>
2	Time domain setting : [Time]
3	Reference level setting : [Amplitude], [2], [0], [dBm]
4	Center frequency setting : [Frequency], [1], [.], [9], [GHz]
5	RBW setting : [BW], F1: <<RBW Manual>>, [1], [MHz]

Step		Procedure
6	VBW setting	: [BW], F2: <<VBW Manual>>, [1], [MHz]
7	Time span setting	: [Time], F2: <<Time Span>>, [5], [msec]
8	Reference setting	: After one sweep, press [→RLV].
9	Trigger setting	: Select Triggered with [Trig/Gate], F1: <<Triggered>> and select Rise with F2: <<Trigger Source>>, F3: <<External>>, F1: <<–10 to 10>>, and F5: <<Trig Slope>>. F4: <<Trig Level>>, [2], [V]
10	RBW setting	: [BW], F1: <<RBW Manual>>, [3], [0], [0], [kHz]
11	VBW setting	: [BW], F2: <<VBW Manual>>, [3], [MHz]
12	Gate setting	: Press [Trig/Gate] until F1: <<Gate Sweep> is displayed. Select On with F1: <<Gate Sweep>>. F2: <<Gate Setup>>, F1: <<Gate Delay>>, and set the gate delay line to the carrier-off region with the rotary knob. F2: <<Gate Length>>, and set the gate length as shown at the right. 
13	Span frequency setting	: [Span], [2], [4], [MHz]
14	Center frequency setting	: [Frequency], [1], [9], [0], [6], [.], [5], [5], [MHz]
15	Sweep time setting	: [Sweep Time], [4], [s], [Single]
	(A) Carrier-off leakage power value P (OFF)	
16	Multi Mkr setting	: [Shift], [Marker] (Multi Mkr), F2: <<Highest 10>>, F5: <<Marker List>> A carrier-off leakage power list (frequency and level of each) is displayed. At this time, if the message "Can not search" is displayed, press [Peak Search].
	★ Example of measurement result: –71.87 dBm	
	(B) Carrier-on leakage power value P(ON)	
17	Turn off the gate	: Press [Trig/Gate] until F1: <<Gate Sweep>> is displayed. Select Off with F1: <<Gate Sweep>, then press [Single].
18	Marker setting	: [Peak Search] The power when the carrier is on is displayed.
	★ Example of measurement result: 1.86 dBm.	
	Carrier off/on power ratio: P (L)–P (O)	

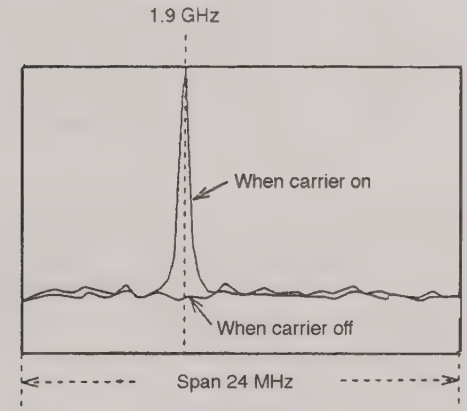
Example 2 When Wide IF Video trigger used

- Set the detection mode to the Pos Peak mode.

(1) Measurement block diagram

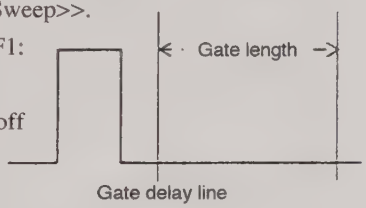


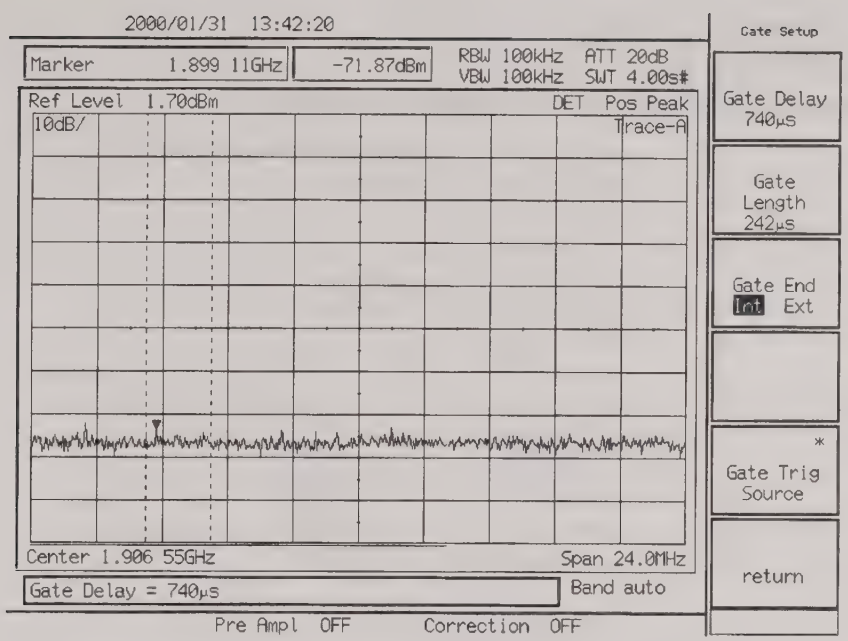
- Input signal frequency : 1.9 GHz
- Center frequency : 1906.55 MHz
- Span frequency width : 24 MHz
- RBW : 300 kHz
- VBW : 3 MHz
- Sweep time : 4 s



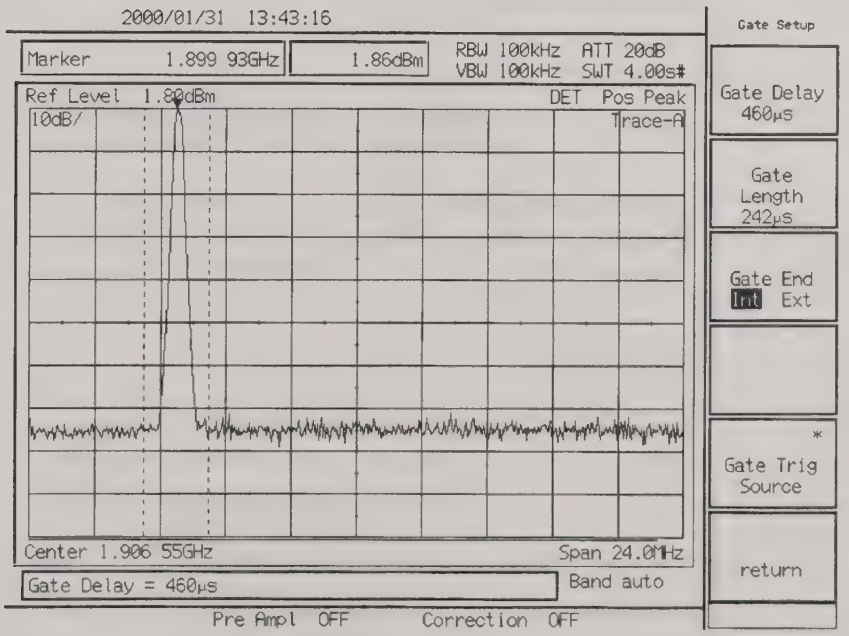
(2) Measurement procedure

Step		Procedure
1	Preset	: Press [Preset], F1: <<Preset All>>, [BW], [More], F6: <<Couple>>; and select "Independent".
2	Reference level setting	: [Amplitude], [2], [0], [dBm]
3	Center frequency setting	: [Frequency], [1], [.], [9], [GHz]
4	RBW setting	: [BW], F1: <<RBW Manual>>, [1], [MHz]
5	VBW setting	: [BW], F2: <<VBW Manual>>, [1], [MHz]
6	Time span setting	: [Time], F2: <<Time Span>>, [5], [msec]
7	Reference level setting	: After 1 sweep, press [→RLV].

Step		Procedure
8	Trigger setting	: Press [Trig/Gate], F1: <<Trigger>>; and select "Triggered". Press F2: <<Trigger Source>>, F2: <<Wide IF Video>>, F1: <<Trig Level>>; and change the trigger level to Low/Middle/ High, in order to find and set the triggerable level. (Use the lower level as possible.)
9	RBW setting	: [BW], F1: <<RBW Manual>>, [3], [0], [0], [kHz]
10	VBW setting	: [BW], F2: <<VBW Manual>>, [3], [MHz]
11	Gate setting	: Press [Trig/Gate] until F1: <<Gate Sweep>> is displayed. Select On with F1: <<Gate Sweep>>. Press F2: <<Gate Setup>>, F1: <<Gate Delay>> and set the gate delay line to the carrier-off region with the rotary knob. Press F2: <<Gate Length>> and set the gate length as shown in the figure at the right with the rotary knob. 
12	Span frequency setting	: [Span], [2], [4], [MHz]
13	Center frequency setting	: [Frequency], [1], [9], [0], [6], [.], [5], [5], [MHz]
14	Sweep time setting	: [Sweep Time], [4], [s]
	(A) Carrier-off leakage power value P (L)	
15	Marker Peak	: [Peak Search]
★	Example of measurement result: –71.87 dBm	
	(B) Carrier-on leakage power value P(ON)	
16	Turn off the gate	: Press [Trig/Gate] until F1: <<Gate Sweep>> is displayed. Select Off with F1: <<Gate Sweep>>, then press [Single].
17	Marker setting	: [Peak Search] The power when the carrier is on is displayed.
★	Example of measurement result: 1.86 dBm	
	Carrier off/on power ratio: P (L)-P (O)	



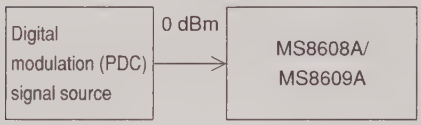
Example of Carrier-Off Leakage Power P (L) Measurement



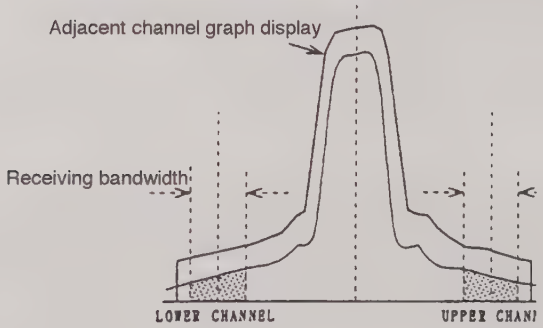
Example of Carrier-On Leakage Power P (O) Measurement

Example of Measurement of Adjacent Channel Leakage Power

(1) Measurement block diagram



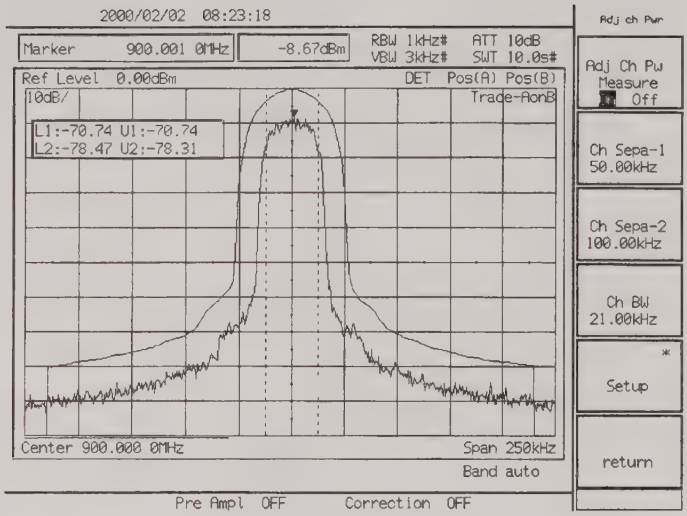
- Center frequency : 900 MHz
- Span frequency width : 250 kHz
- RBW : 1 kHz
- VBW : 3 kHz
- Sweep time : 10 s



(2) Measurement procedure

Step		Procedure
1	Preset	: [Preset], F1: <<Preset All>>
2	Span frequency setting	: [Span], [2], [5], [0], [kHz]
3	Center frequency setting	: [Frequency], [9], [0], [0], [MHz]
4	RBW setting	: [BW], F1: <<RBW Manual>>, [1], [kHz]
5	VBW setting	: [BW], F2: <<VBW Manual>>, [3], [kHz]
6	Reference level setting	: [Amplitude], [0], [dB]
7	Sweep time setting	: [Sweep Time], [1], [0], [s]
8	ATT setting	: Press [Atten], then set to the minimum value with the rotary knob.
9	Single sweep	: [Single]

Step	Procedure
10	Measurement preparation : Press [Measure] and then [More]. Then press F2: <<Adj Ch Pwr>>.
11	Adjacent channel setting : F3: <<Setup Freq*>> F1: <<Ch Sepa-1>>, [5], [0], [kHz] F2: <<Ch Sepa-2>>, [1], [0], [0], [kHz] (*1)
12	Receiving bandwidth setting: F4: <<Ch BW>>, [2], [1], [kHz] F6: <<return>>
13	Method of calculation : Press F5: <<Setup Method*>>, F1, F2, F3; and select Total Pwr, Ref Level, or Inband. (*2) F6: <<return>>
14	Graph display : When On is selected while pressing <<Setup Graph*>> and then F1: <<ACP Graph>>, graph display is performed.
15	Channel display method : When On is selected with F2: <<Ch Center Line>>, a line which indicates the adjacent frequency center frequency is displayed. When On is selected with F3: <<Ch BW Line>>, a line which indicates the adjacent channel bandwidth is displayed. When On is selected with F4: <<Inband BW Line>>, a line which indicates the Inband is displayed.
16	Measurement channel setting: [More], F1: <<Both Channel>>, F6: <<return>>, F6: <<return>>
17	Measurement : F1: <<Adj Ch Pwr On>> The measured value is displayed at the top left-hand corner of the screen.



Example of Adjacent Channel Leakage Power Measurement

Note:

*1 Reference channel center-In total power method and Inband method, this is defined as the center of zone marker.
In Reference level method, the display's center is defined as reference channel center.

*2 The reference value for each of the calculation method is defined as below.
Total Power method: The total power of entire waveform displayed.
Ref Level method: The reference level value of the display.
Inband method: The total power in the "Inband" defined with marker zone center as reference channel center.

Example of Memory Card Use

If the measurement screen is stored in a memory card, the same measurement can be performed later by recalling the stored measurement screen. This eliminates troublesome setting of the measurement parameters each time and prevents setting errors. It is designed especially to shorten the measurement time when the setting operation is complex.

Storage method (Assume that the DATA number is 20.)

1) Measurement screen single sweep: [Single]
2) Press [Shift], [Recall] (save), [More] until F1: <<Save to Mem Card>> is displayed, then press F1: <<Save to Mem Card>>, [2], [0], [Enter].
   This completes saving of the screen parameters to Memory Card 20.

Recalling method (Assume that the DATA number is 20.)

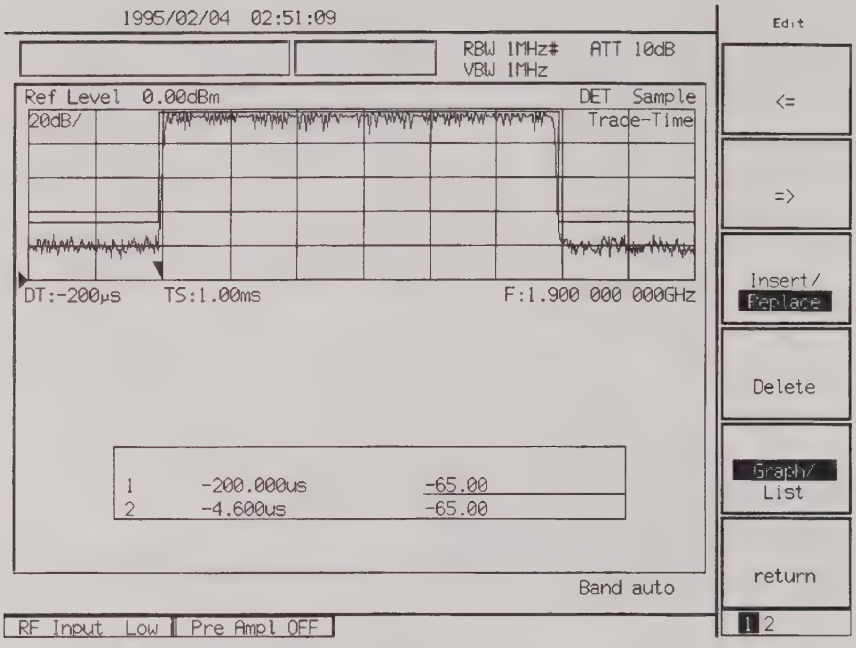
1) Stored screen display: Press [More] until [Recall], F1: <<Recall from Mem Card>> is displayed, then press F1: <<Recall from Mem Card>>, [2], [0], [Enter].
2) Continuous sweep : [Continuous]

Example of Time Template Creation (PHS Transmit Signal)

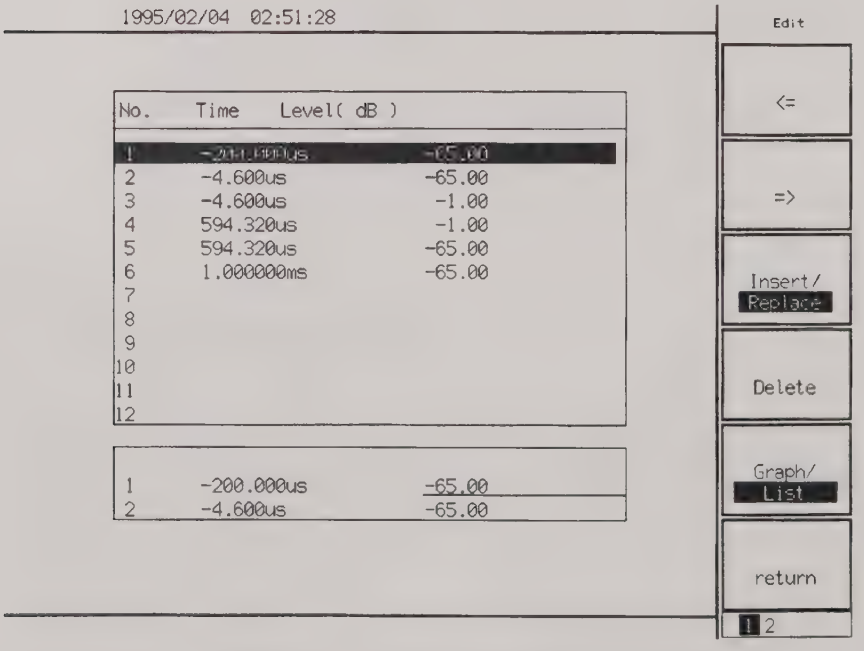
1) Burst wave screen setting (time domain)

Time span	: 1 ms
Trigger	: –200 us
RBW	: 1 MHz
VBW	: 1 MHz
RLV	: +15 dBm

2) Template data overwrite method
   - Template scale number setting (No. 1 here):
     Press [Time], [Measure] until F5: <<Time Template>> is displayed, then press F1: <<Time Template>>, F5: <<Setup Temp Table>>, F1: <<Select Temp Table>>, F1: <<Temp-1>>, F6: <<return>>.
   - Data write preparation: Select Relative with F2: <<Level>>.
     F3: <<Make Up Temp Table>>, [More], F2: <<Select Line>>, F1: <<Limit1 Upper>>, F6: <<return>>, [More] (Here, Limit1 Upper is specified.)
   - Data write: Sequentially write the coordinates (time, level) of the template to be created in ascending order of time value.
     Write data by alternately repeating time setting and level setting.
     * Time setting (example: –200 us) : [+/–], [2], [0], [0], [us]
     * Level setting (example: –65 dB) : [+/–], [6], [5], [dB]
   - Limit1 Lower write: Press [More], F2: <<Select Line>>, F2: <<Limit 1 Lower>>, F6: <<return>>, [More], then write the template coordinate data.

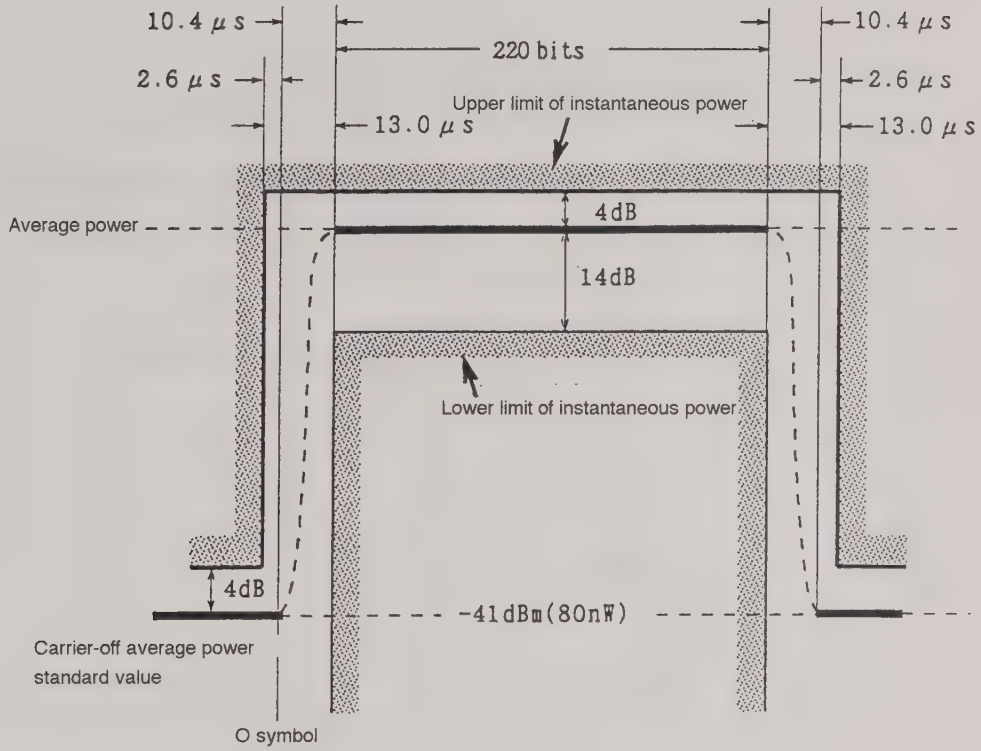


TEMPLATE Creation Screen (Graph)



TEMPLATE Creation Screen (List)

3) Template coordinates (PHS: RCR STD-28)

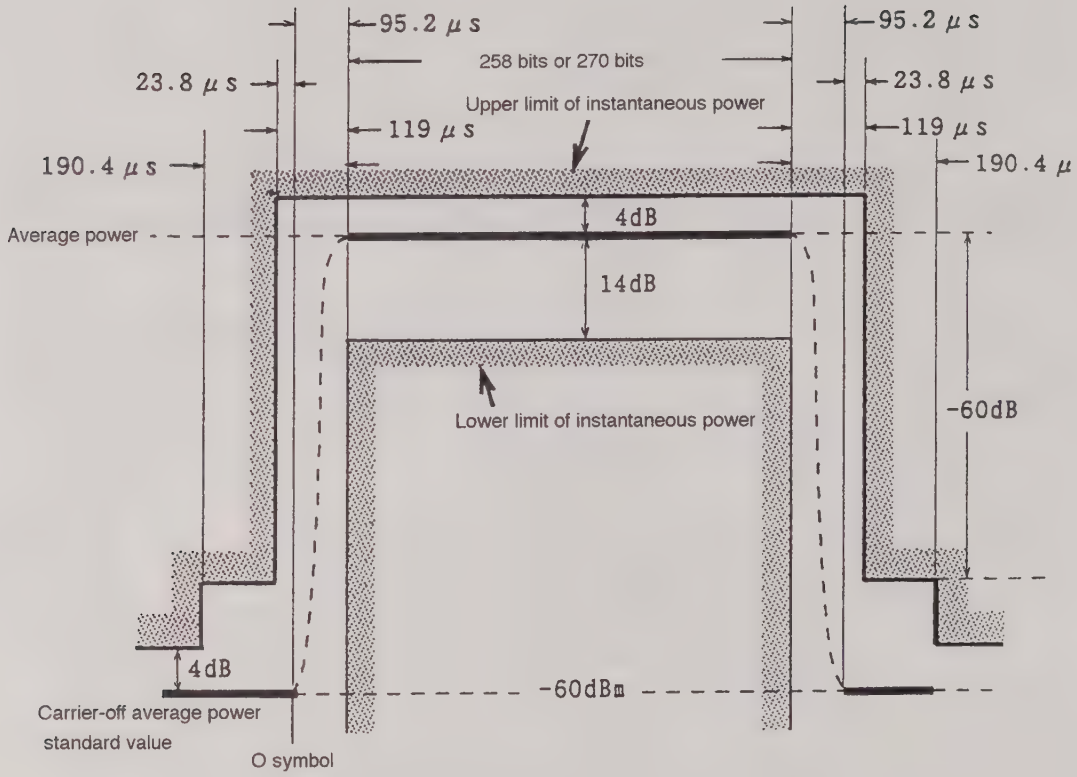


Coordinate reference line (Trigger position → left end of screen: –200 μs)

When average power in burst of input signal is 19 dBm and SPA REF LEVEL is 24 dBm

- Limit1 Upper coordinates
  - (1) –200 μs, –65 dB
  - (2) –4.6 μs, –65 dB
  - (3) –4.6 μs, –1 dB
  - (4) 594.32 μs, –1 dB
  - (5) 594.32 μs, –65 dB
  - (6) 1 ms, –65 dB
- Limit1 Lower coordinates
  - (1) –8.40 μs, –100 dB
  - (2) –8.40 μs, –19 dB
  - (3) 581.32 μs, –19 dB
  - (4) 581.32 μs, –100 dB

4) Template coordinates (PDC-RCR STD-27B)

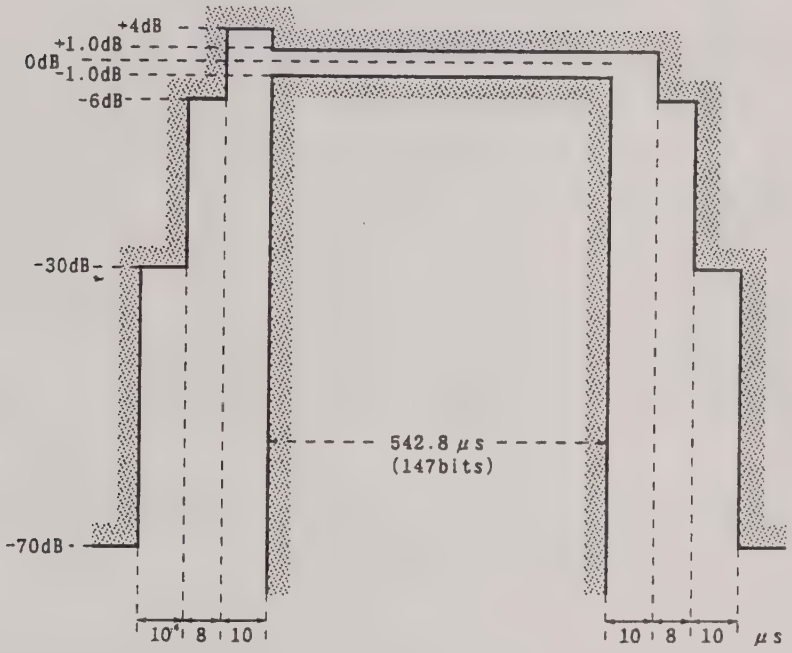


Coordinates standard line (Trigger position → screen left end: –1 ms)

When average power in burst of input signal is 10 dBm and SPA REF LEVEL is 15 dBm

- Limit1 Upper coordinates
  - (1) –1.7 ms, –71 dB
  - (2) –114.21 µs, –71 dB
  - (3) –114.21 µs, –65 dB
  - (4) 42.81 µs, –65 dB
  - (5) 42.81 µs, –1 dB
  - (6) 6.6238 ms, –1 dB
  - (7) 6.6238 ms, –65 dB
  - (8) 6.6952 ms, –65 dB
  - (9) 6.6952 ms, –71 dB
  - (10) 8.3 ms, –71 dB
- Limit1 Lower coordinates
  - (1) –76.19 µs, –100 dB
  - (2) –76.19 µs, –19 dB
  - (3) 6.5048 ms, –19 dB
  - (4) 6.5048 ms, –100 dB

5) Template coordinates (GSM, DCS1800)



Coordinates standard line (Trigger position → left end of screen: –75.0 µs)

- Limit 1 Upper coordinates

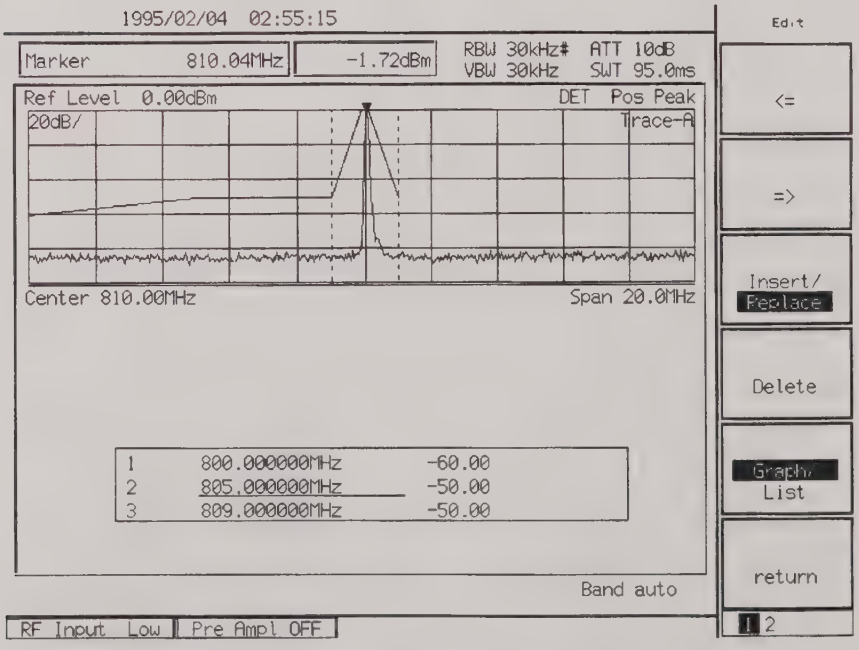
(1)	–75.0 µs,	–75 dB
(2)	–25.0 µs,	–75 dB
(3)	–25.0 µs,	–35 dB
(4)	–15.0 µs,	–35 dB
(5)	–15.0 µs,	–11 dB
(6)	–7.0 µs,	–11 dB
(7)	–7.0 µs,	–1 dB
(8)	3.0 µs,	–1 dB
(9)	3.0 µs,	–4 dB
(10)	555.8 µs,	–4 dB
(11)	555.8 µs,	–11 dB
(12)	563.8 µs,	–11 dB
(13)	563.8 µs,	–35 dB
(14)	573.8 µs,	–35 dB
(15)	573.8 µs,	–75 dB
(16)	625.0 µs,	–75 dB

- Limit1 Lower coordinates

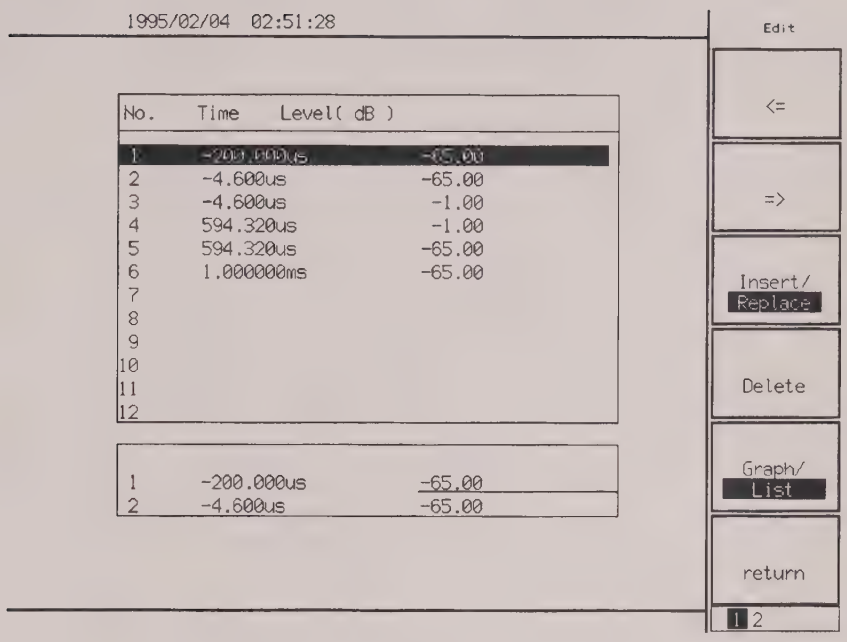
(1)	3.0 µs,	–100 dB
(2)	3.0 µs,	–6 dB
(3)	545.8 µs,	–6 dB
(4)	545.8 µs,	–100 dB

MASK Creation in Frequency Domain Mode

1) Mask data write method
   - Template scale number setting (Here it is 1.):
     Press [A, B] and F1: <<Trace A>> and press [Measure] until F4: <<Mask>> is displayed, then press F3: <<Mask>>, F5: <<Setup Mask Table>>, F1: <<Select Mask Table>>, F1: <<Mask-1>>, F6: <<return>>.
   - Data write preparation: Select Relative with F2: <<Level>>.
     F3: <<Make Up Mask Table>>, [More], F2: <<Select Line>>, F1: <<Limit1 Upper>>, F6: <<return>>, [More] (Here, Limit1 Upper is specified.)
   - Data write: Write the coordinates (frequency, level) of the template to be created in ascending order of time value.
     Write the data by alternately repeating time setting and level setting.
     * Frequency setting (example: 800 MHz): [8], [0], [0], [MHz]
     * Level setting (example: –60 dB): [+/–], [6], [0], [dB]
   - Limit1 Lower write: Press [More], F2: <<Select Line>>, F2: <<Limit1 Lower>>, F6: <<return>>, [More], then write the mask data coordinates data.



MASK Creation Screen (Graph)



MASK Creation Screen (List)

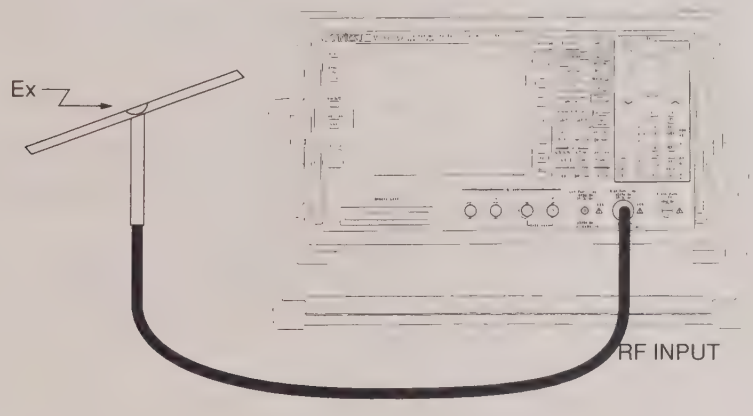
Section 13 Measurement of Field Strength

This chapter gives the explanation and cautions on the operation procedure of field strength measurement using the MS8608A/MS8609A Digital Mobile Radio Transmitter Tester

Field Strength Measurement 13-3
Direct Measurement of Field Strength Using a Designated Antenna 13-3
Method to Seek Field Strength by Calculation 13-5
User Antenna Factor Setting, Save/Local to /from a Memory Card 13-6
Save/Load of User antenna factor To/From a Memory Card 13-6
Caution: When Performing Field Strength Automatic Measurement 13-7

Field Strength Measurement

In field strength measurement, incoming wave is received and measured by connecting a measuring antenna and RF Input connector of the MS8608A/MS8609A with a coaxial cable as in the illustration below.



Direct Measurement of Field Strength Using a Designated Antenna

The system has a built-in antenna factor correction process for the purpose of measurements using antenna. By selecting an antenna to be used from the menu, field strength can be directly indicated.

Cal

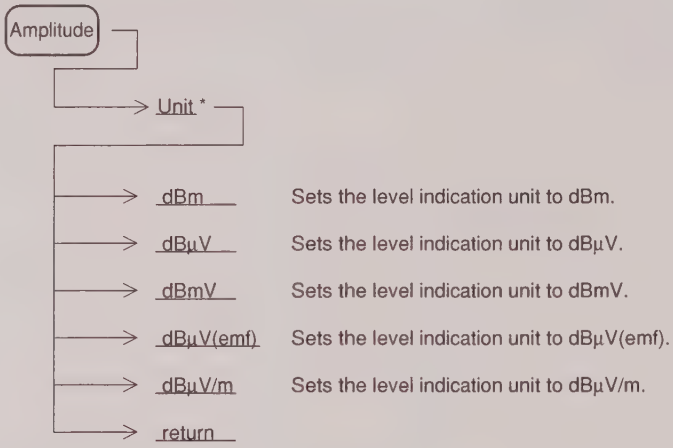
Shift → 0 → (Press "More" key to display page 2 of the menu)

→ Antenna Factor *

- → Off — Does not perform correction of antenna factor.
- → Dipole — Performs the correction of antenna factor of MP534A/651A dipole antenna.
- → Log-1 — Performs the correction of antenna factor of MP635A log-periodic antenna.
- → Log-2 — Performs the correction of antenna factor of MP666A log-periodic antenna.
- → Loop — Performs the correction of antenna factor of MP414P loop antenna.
- → return

- → User-1 — Sets the correction factor of the user's antenna, and performs correction. 4 types, from 1 to 4, of antenna correction factors can be set and select.
- → User-2
- → User-3
- → User-4
- → Setup *
  User Antenna F — Performs operation of the user antenna correction factor data file.
- → return

When an antenna to be used is selected, the indication unit of the levels is set to "dBμV/m" automatically. Correction factors of some antennas are defined by open terminal. In that case, set the unit at "dBμV (emf)" (open terminal).



Method to Seek Field Strength by Calculation

Generally, field strength is given by (Ex=Px+K0).

Px: measured value (dBμV)

K0: antenna calibration factor (dB) ..... The factor for converting the measured voltage {dBμV (final value)} into field strength (dBμV/m)

a. Set the level indication unit to dBμV, and measure the received signal by dBμV.

b. Refer the chart attached to the antenna for the value K0, and calculate the appropriate field strength.

Note:

In some antennas, the antenna calibration factor is defined by the following;

Ex=Px-K0

Px: measured value (dBμV (emf))

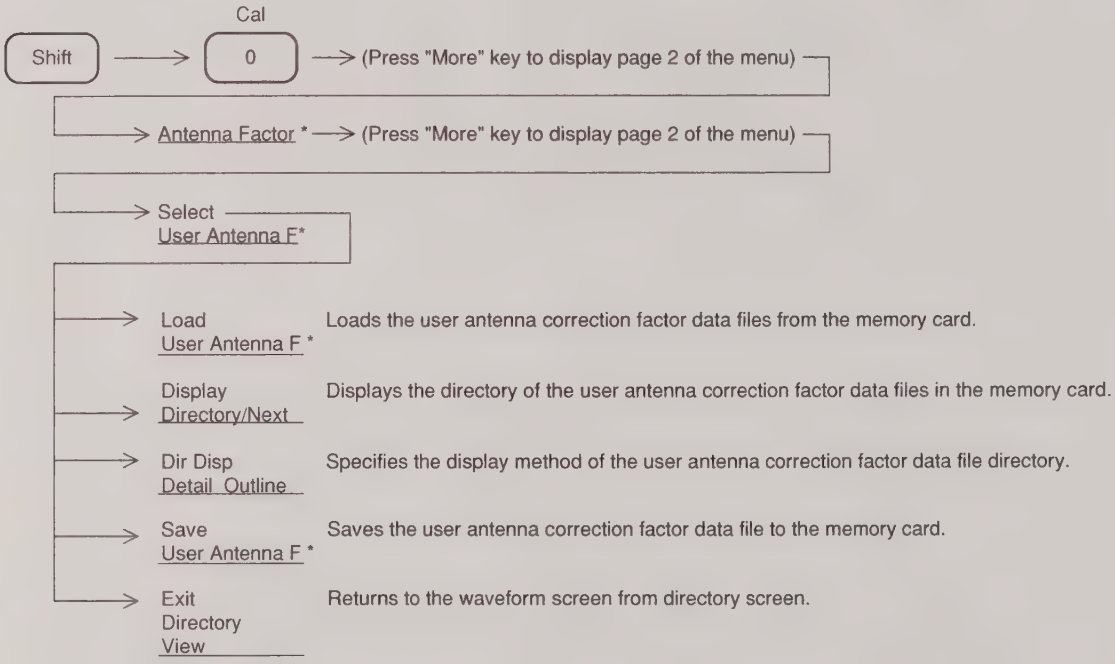
K0: antenna calibration factor (dB)

In this case, press [F6] function key to select UNIT dBμe, and measure the received signal by dBμV (emf).

User Antenna Factor Setting, Save/Local to /from a Memory Card

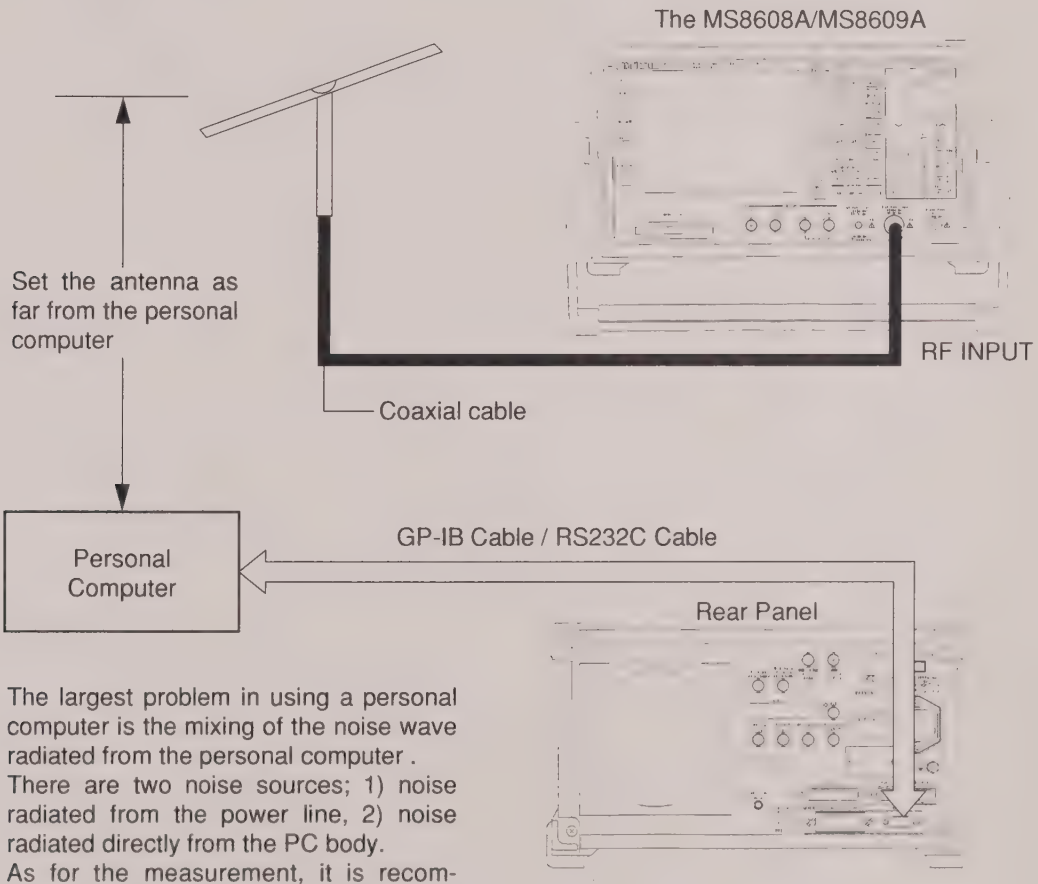
Save/Load of User antenna factor To/From a Memory Card

The antenna correction factor data programmed from RS232C/GPIB can be saved in a memory card. The antenna correction factor data saved in the memory card can be reused by loading.


Cal
Shift
0
(Press "More" key to display page 2 of the menu)
Antenna Factor *
(Press "More" key to display page 2 of the menu)
Select
User Antenna F*
Load
User Antenna F *
Loads the user antenna correction factor data files from the memory card.
Display
Directory/Next
Displays the directory of the user antenna correction factor data files in the memory card.
Dir Disp
Detail Outline
Specifies the display method of the user antenna correction factor data file directory.
Save
User Antenna F *
Saves the user antenna correction factor data file to the memory card.
Exit
Directory
View
Returns to the waveform screen from directory screen.

Caution: When Performing Field Strength Automatic Measurement

When automatically measuring field strength, it is done by RS232C or GPIB control. Since a personal computer is used in such a case, it is necessary to note the following;



The largest problem in using a personal computer is the mixing of the noise wave radiated from the personal computer .
There are two noise sources; 1) noise radiated from the power line, 2) noise radiated directly from the PC body.
As for the measurement, it is recommended to set the antenna as far from the personal computer , Interface cable, and AC line or the like as possible.
Also, utilizing the directivity of antenna, turn the antenna or place the other equipment so as to minimize the reception of the noise.

Caution: Be Careful When Connecting With a Personal Computer

Appendix A Soft-Key Menu

In this section, soft-key menu functions and its hierarchical system are described using a tree.

Soft-key Menu List A-4
Spectrum mode Menu Tree A-6
Config mode Menu Tree A-27

In this section, soft-key menu functions and its hierarchical system are described using a tree.
Matters to be noted about the tree are shown below.

(1) Panel Key indicates a hard key on the front panel.

(2) Top menus are the menus at the top level which are displayed on the screen when the panel key is pressed. Lower menus indicates other menus below the top menus.

(3) When a soft key with an appended asterisk (*) is pressed in these menus, the menu moves to the lower menu indicated by the arrow symbol (->). However, if any not-supported-function soft key in an Option is pressed, an error message is displayed.

(4) When the Return key is pressed at a lower menu, the next-higher menu is returned.

(5) Menus with more than six items are split into several pages.

(6) The menu page construction and currently-displayed page are indicated in the lower part of the menu. To move to the next page, press the More key.

(7) Panel keys and soft keys prefixed by a sharp symbol (#) at the left of the menu frame, give an outline explanation of the function.

Soft-key Menu List

Menu	Menu Tree (page/21)
A) A/B,A/BG	15
A/Time	16
ACP Setup1	8
ACP Setup2	8
ACP Setup3	8
Adj ch Pwr	8
Amplitude	2
Attenuator	3
Avg Count	14
B) Burst Pwr	11
C) C/N Meas	7
Channel Power Measure	7
Cal	20
Change Clr	19
Copy Cont	18
Copy from	19
Correction	2
Count Setup	7
D) Define Clr	19
Detection	14 , 16
Dip	5
Disp Line	2 , 4
Display Config 1/2	
E) Expand	16
F) Freq Count	7
Frequency	1
G) Gate	17
Gate Setup	17
GPIB Config 2/2	
H) Hold Count	14
I) Impedance	2
Interface Config Config 2/2	
Item	12

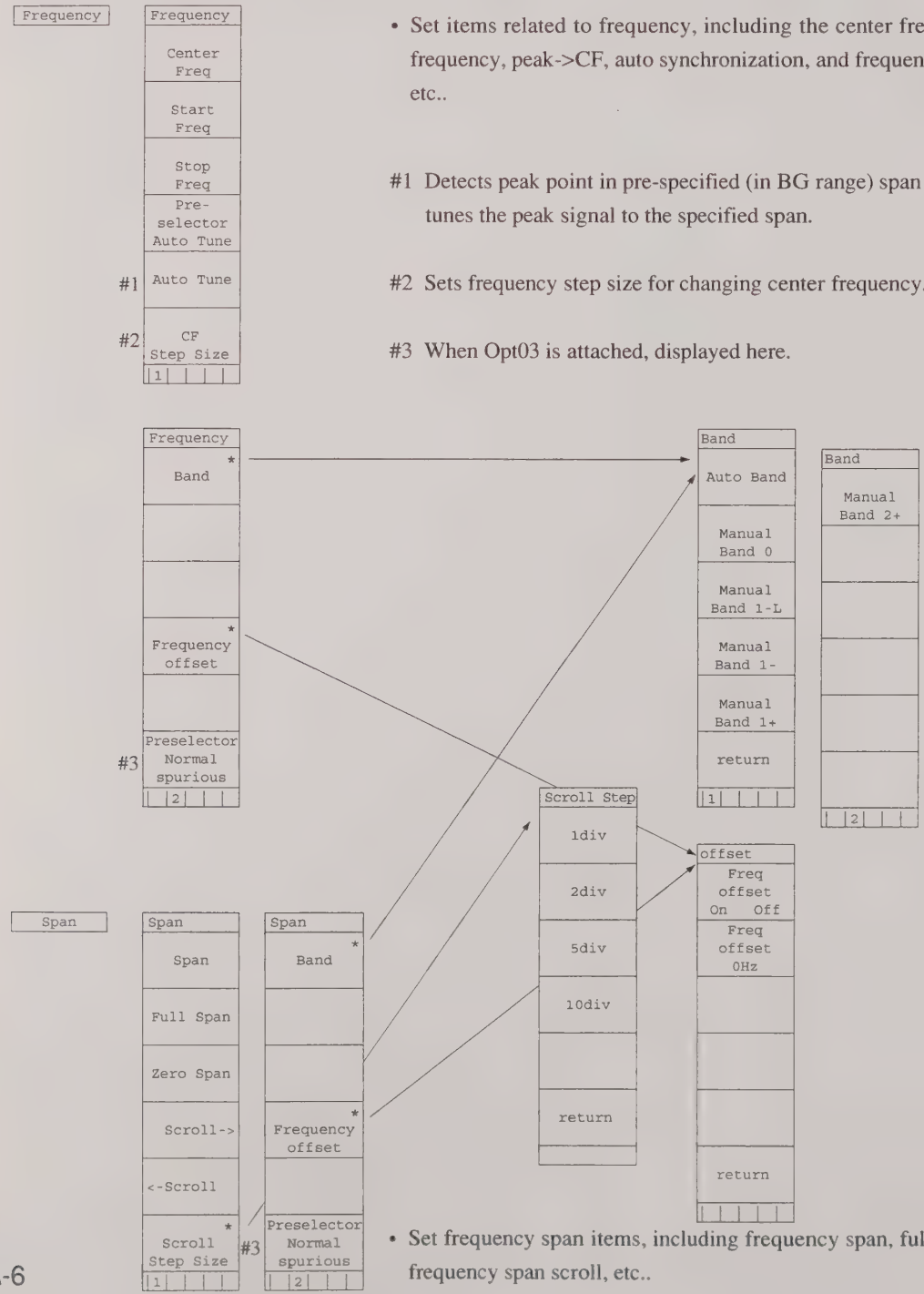
Menu	Menu Tree (page/21)
L) LCD Brightness	27
Lin Scale	2
Line	9 , 10
Load/Save	9 , 10
Log Scale	2
Lvl Offset	2
M) Manual Set	4
Marker	4
Marker->	4 , 5
Mask Meas	9
Measure	7
Mkr List	4
Move Mask	9
Move Temp	10
Multi Marker	4
N) Noise Meas	7
O) OBW Setup	8
Occ BW	8
P) Peak	5
Power On Config 1/2	
Pre Ampl	2
Preset	21
Preslctr	20
Printer	18
Q)	
R) RBW	3
Recall	12
Ref Line	14
Ref Step	2
RS232C Config 2/2	

Menu	Menu Tree (page/21)
S) Save	13
Save Media	18
Scroll Step	1
Select	2 , 9 , 10
Set Date	Config 1/2
Set Time	Config 1/2
Setup	2
Setup Mask	9
Setup Temp	10
Source	17
Span	1
Storage	14 , 16
Sweep Time	3
Swp Contl	15 , 16
System	18
T) Temp Meas	10
Threshold	5
Title	Config 1/2
Trace A,B	14
Trace Calc	14
Trace Move	14
Trace Time	16 , 17
Trig Ext	17
Trig Video	17
Trigger	17
U) Units	2
V) VBW	3
W) Wide IF	17
Z) Zone Width	4

Spectrum mode Menu Tree

Menu Tree (1 /21)

— Panel Key —+— Top menu —+— Lower menues —



- Set items related to frequency, including the center frequency, start/stop frequency, peak->CF, auto synchronization, and frequency scroll step size, etc..

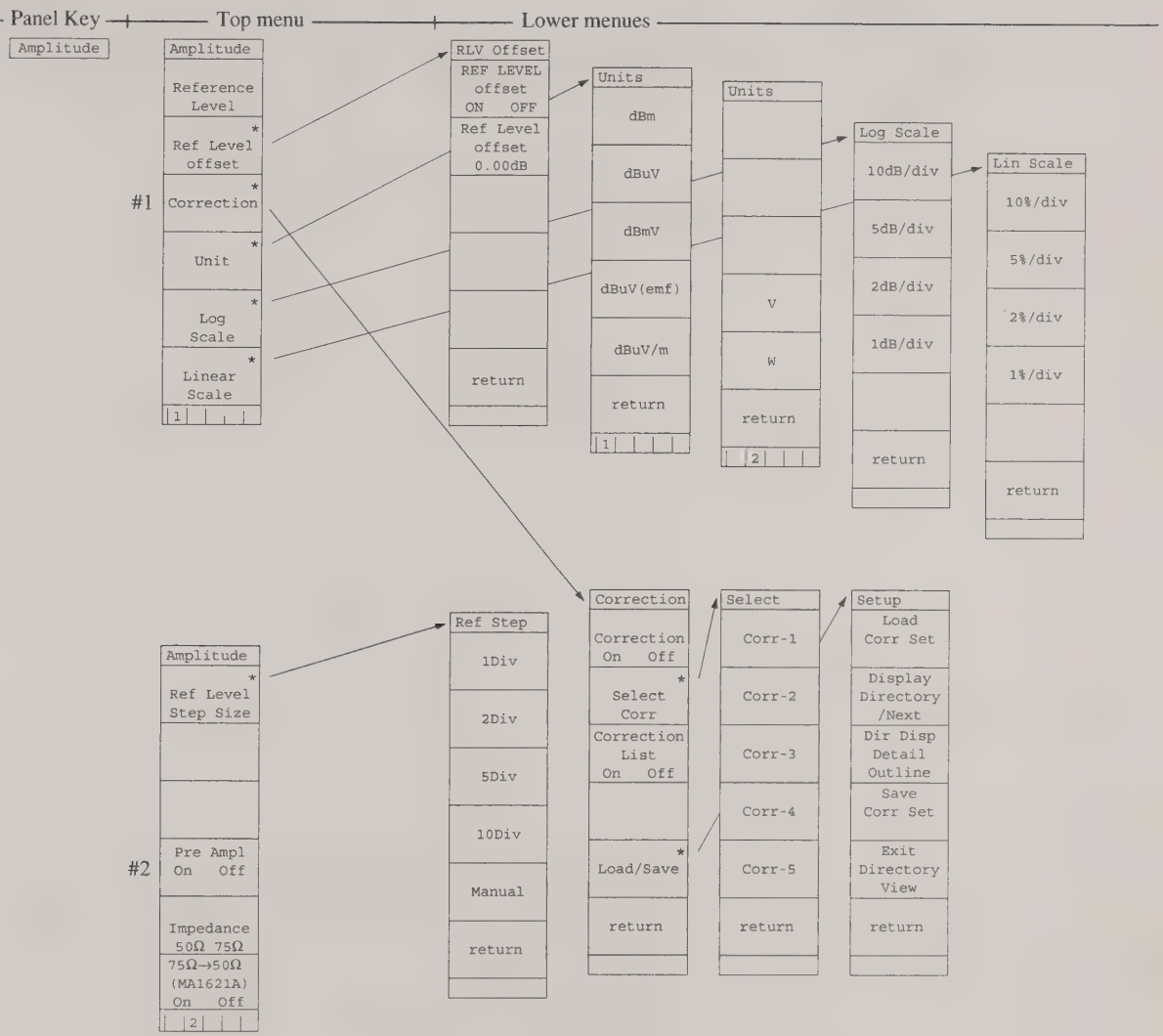
#1 Detects peak point in pre-specified (in BG range) span and automatically tunes the peak signal to the specified span.

#2 Sets frequency step size for changing center frequency.

#3 When Opt03 is attached, displayed here.

- Set frequency span items, including frequency span, full span, zero span, frequency span scroll, etc..

Menu Tree (2/21)

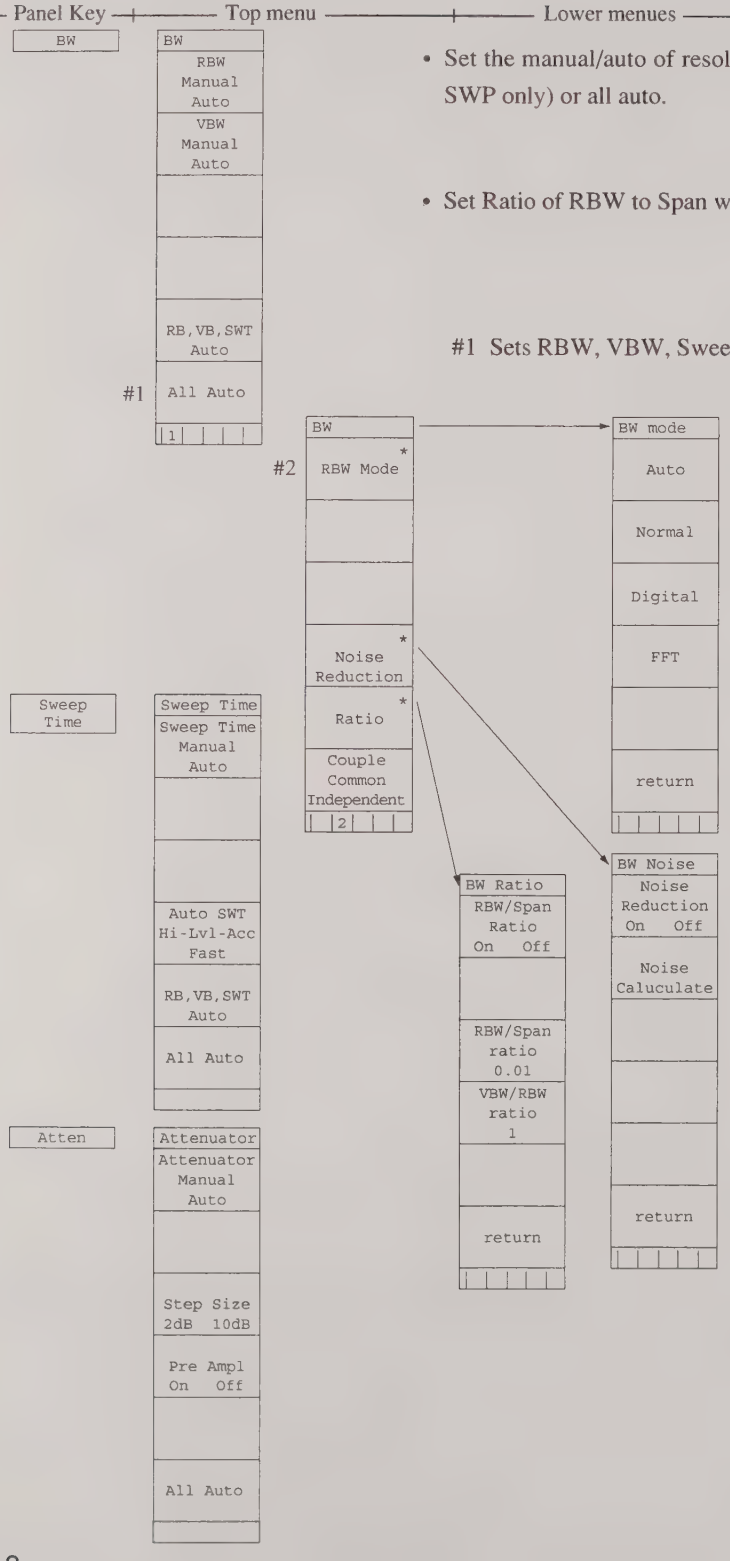


#1 Sets correction (frequency-response characteristics correction) function.

#2 Make the 20 dB pre-amplifier On/Off.

- Set items along the vertical axis of the screen, including reference level, Peak->RLV, reference level offset, measurement level unit, Log/Lin scale switching, reference level step size, display line, attenuator, pre-amplifier On/Off, 75 Ω impedance, transformer, frequency-response correction, etc..

Menu Tree (3/21)



- Set the manual/auto of resolution bandwidth, and auto (RBW, VBW and SWP only) or all auto.
- Set Ratio of RBW to Span when RBW is Auto and Ratio Mode is "on".

#1 Sets RBW, VBW, Sweep Time, Atten all to Auto.

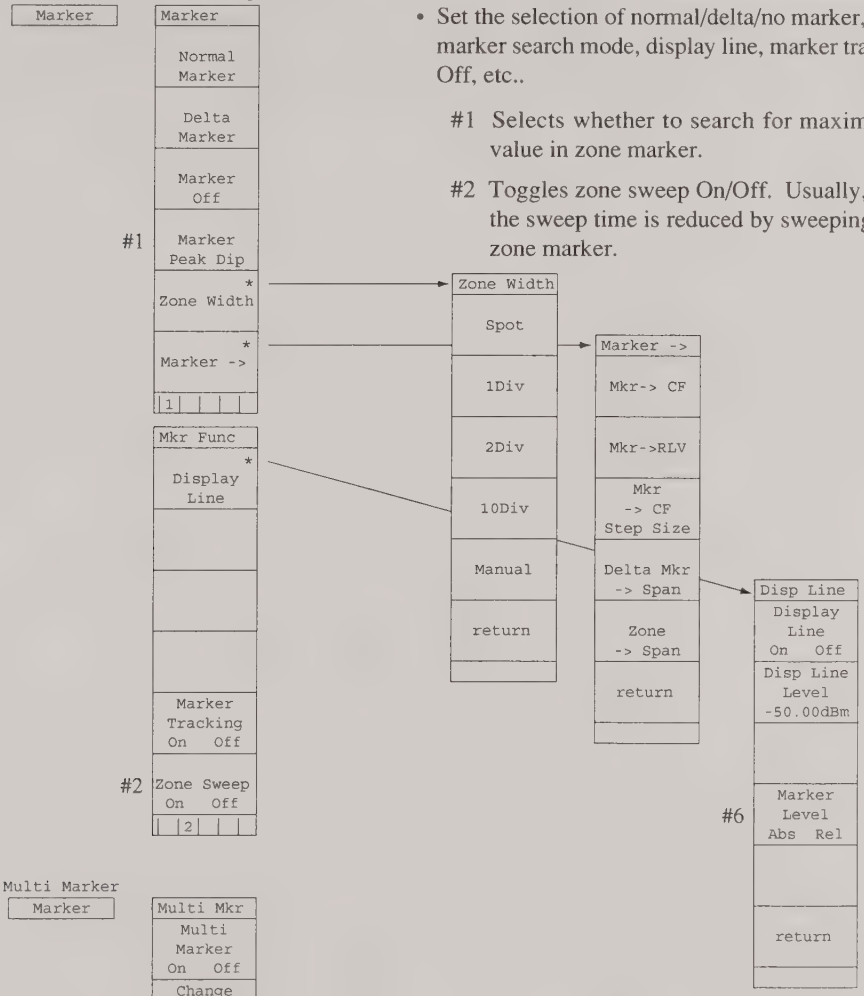
- Set the manual/auto of video bandwidth, and auto (RBW, VBW and SWT only) or all auto.

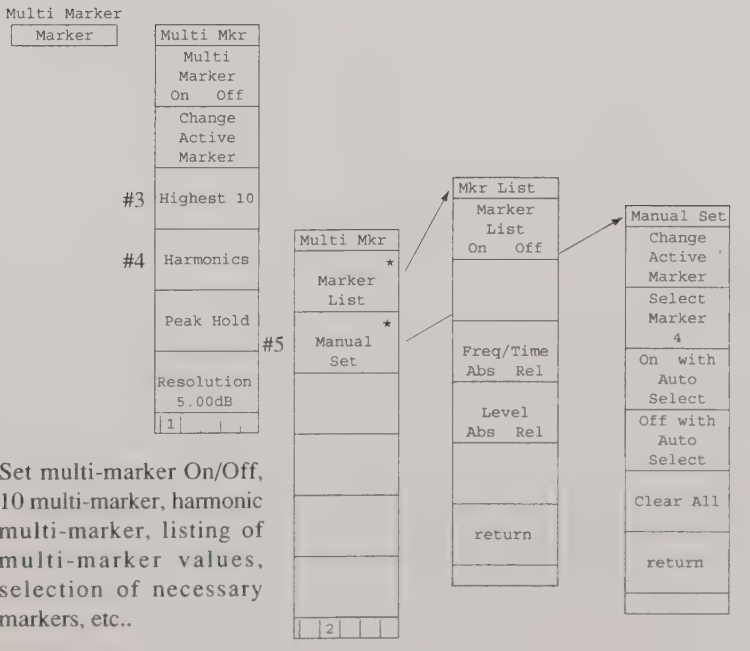
#2 Sets RBW mode to normal (Analog) or Digital when Option 04 Digital RBW is installed.

- Set the manual/auto of sweep time, and auto (RBW, VBW and SWT only) or all auto.
- Set the manual/auto of the input attenuator, On/Off of the pre-amplifier and all auto.

Menu Tree (4 /21)

Panel Key — Top menu — Lower menues





- Set the selection of normal/delta/no marker, zone marker width, marker->, marker search mode, display line, marker tracking On/Off, zone sweep On/Off, etc..

  #1 Selects whether to search for maximum (Peak) or minimum (Dip) value in zone marker.

  #2 Toggles zone sweep On/Off. Usually, the zone sweep is Off. At On, the sweep time is reduced by sweeping only the zone specified by the zone marker.

- Set multi-marker On/Off, 10 multi-marker, harmonic multi-marker, listing of multi-marker values, selection of necessary markers, etc..

  #3 Allocates up to 10 multi-markers sequentially from the peak level of the signal displayed on screen.

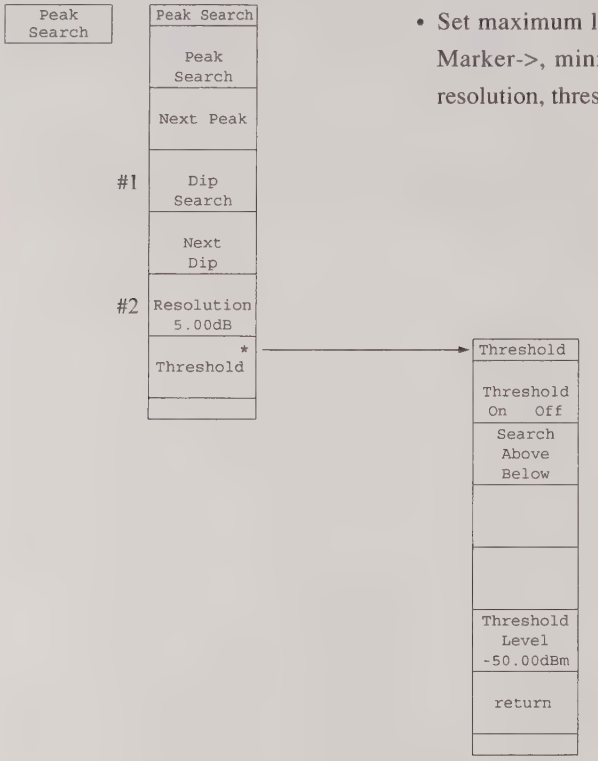
  #4 Allocates multi-markers to the harmonic signals of frequency indicated by current marker.

  #5 Function allowing user to select only multi-markers necessary for measurement.

  #6 Select "absolute value" or "relative value (display line)" to display marker level.

Menu Tree (5 /21)

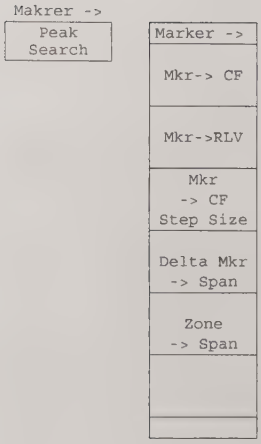
Panel Key — Top menu — Lower menues



- Set maximum level search, next peak, next right peak, next left peak, Marker->, minimum level search, next minimum level, search level resolution, threshold level On/Off, etc..

#1 Searches for minimum (Dip) level.

#2 Sets peak-search level resolution.

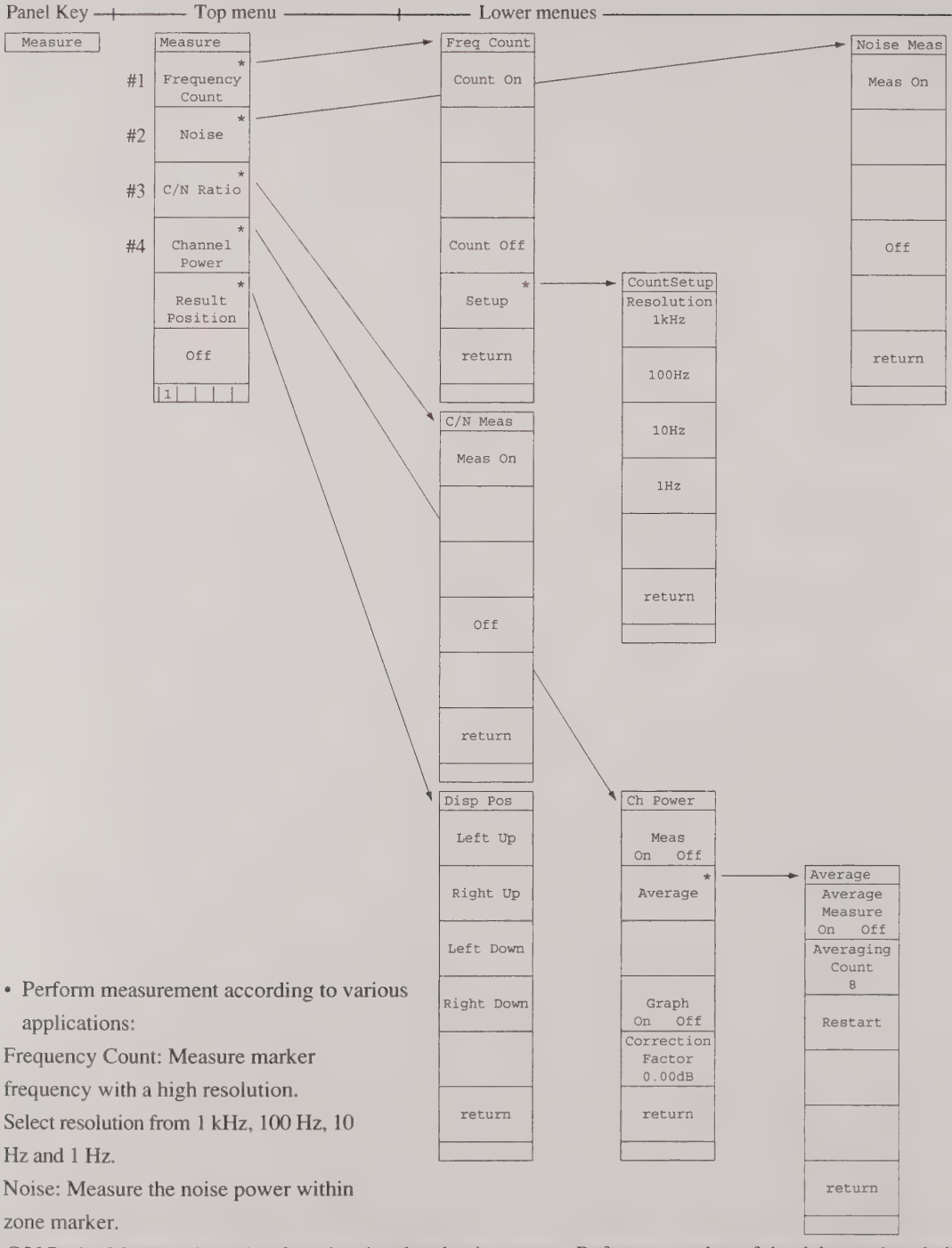


- Set marker value -> center frequency, marker value -> reference level, marker value -> CF step size, delta marker-> span, zone marker -> span, etc..

Menu Tree (6/21)

Panel Key	Top menu	Lower menues
	Peak →cf	
	Peak →RLV	
	Single	
	Continuous	
	Single	

Menu Tree (7/21)



- Perform measurement according to various applications:

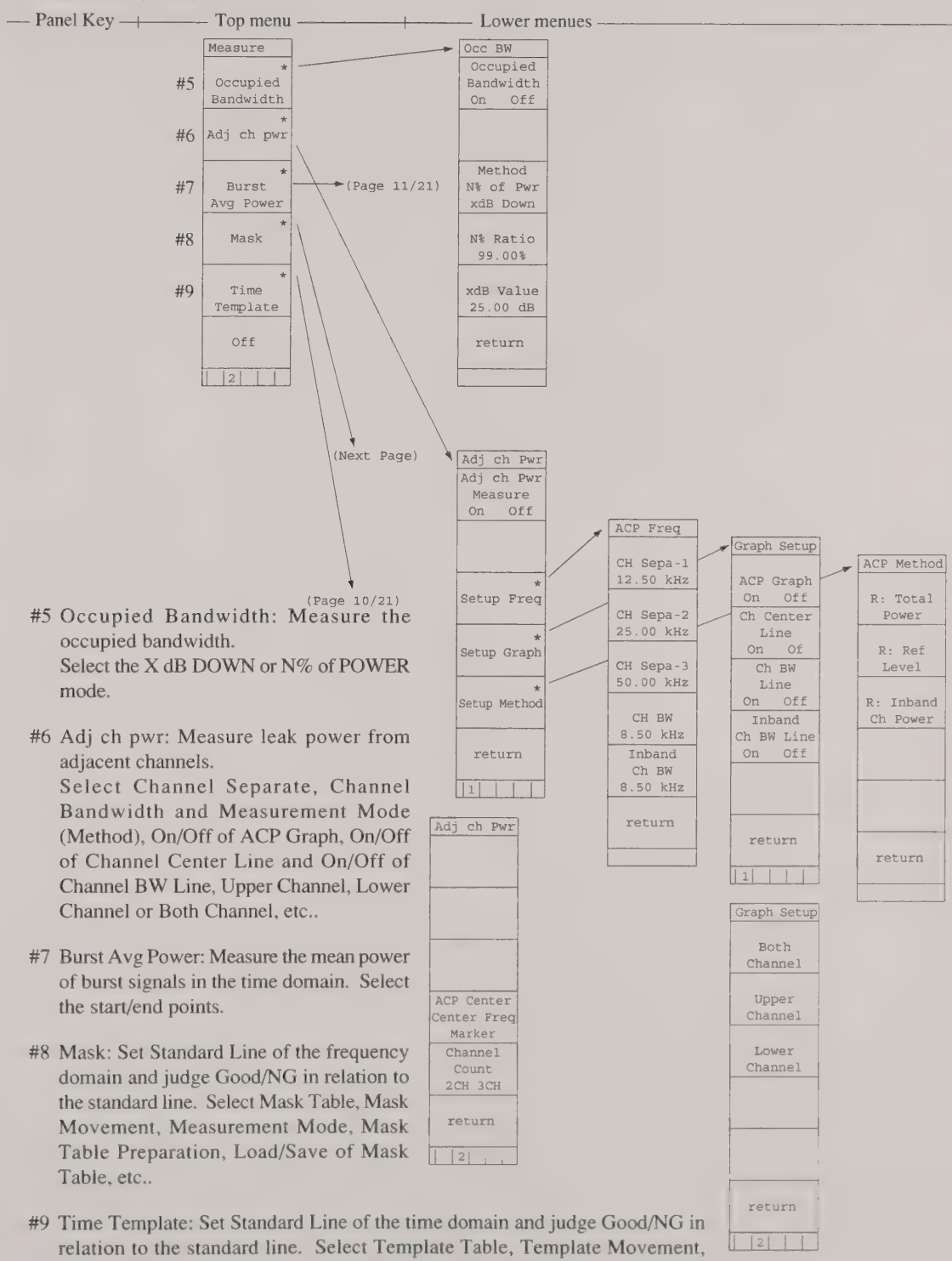
#1 Frequency Count: Measure marker frequency with a high resolution. Select resolution from 1 kHz, 100 Hz, 10 Hz and 1 Hz.

#2 Noise: Measure the noise power within zone marker.

#3 C/N Ratio: Measure the ratio of carrier signal and noise power. Reference marker of the delta marker shall be set to the carrier, and marker's zone width specifies the power measured.

#4 Channel Power: Power with in the band indicated by zone marker is measured. It is possible to set an arbitrary calibration value.

Menu Tree (8/21)



#5 Occupied Bandwidth: Measure the occupied bandwidth.
Select the X dB DOWN or N% of POWER mode.

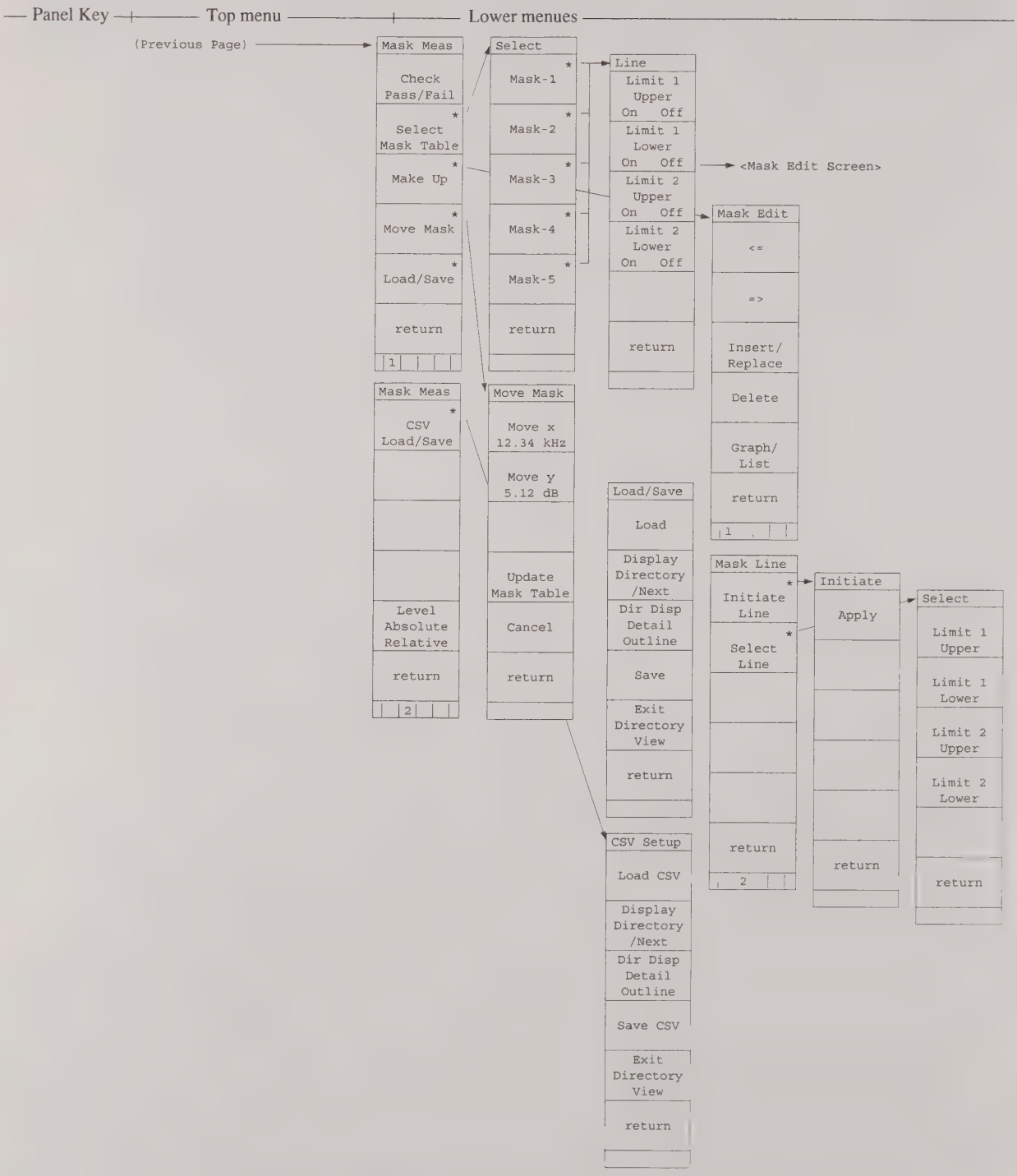
#6 Adj ch pwr: Measure leak power from adjacent channels.
Select Channel Separate, Channel Bandwidth and Measurement Mode (Method), On/Off of ACP Graph, On/Off of Channel Center Line and On/Off of Channel BW Line, Upper Channel, Lower Channel or Both Channel, etc..

#7 Burst Avg Power: Measure the mean power of burst signals in the time domain. Select the start/end points.

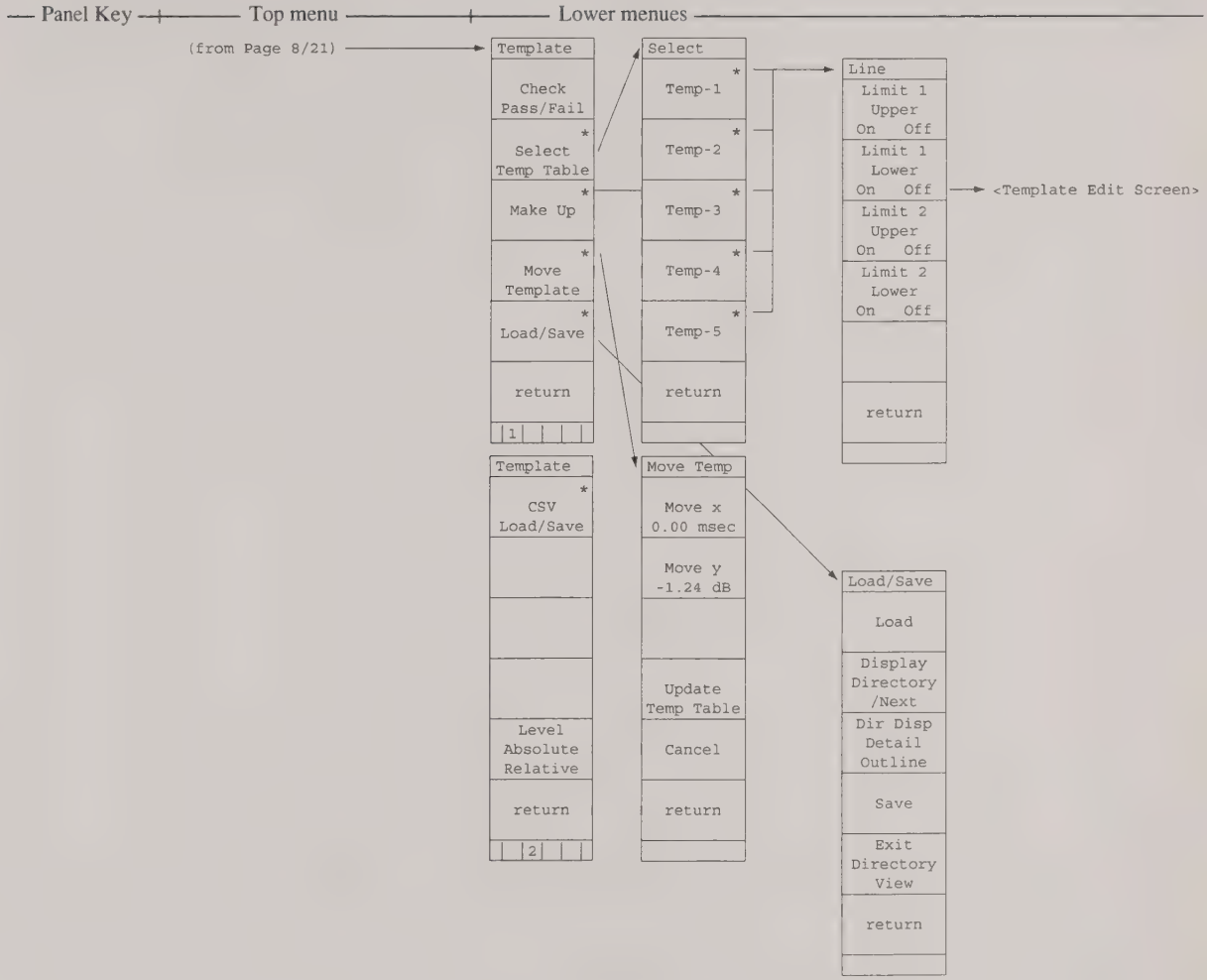
#8 Mask: Set Standard Line of the frequency domain and judge Good/NG in relation to the standard line. Select Mask Table, Mask Movement, Measurement Mode, Mask Table Preparation, Load/Save of Mask Table, etc..

#9 Time Template: Set Standard Line of the time domain and judge Good/NG in relation to the standard line. Select Template Table, Template Movement, Measurement Mode, Template Table Preparation, Load/Save of Mask Table, etc..

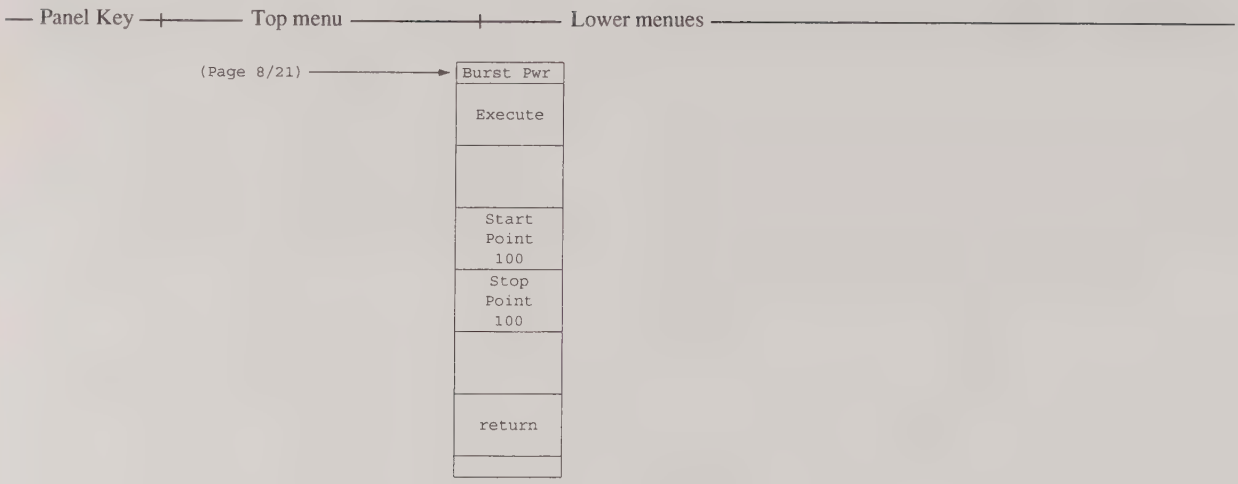
Menu Tree (9/21)



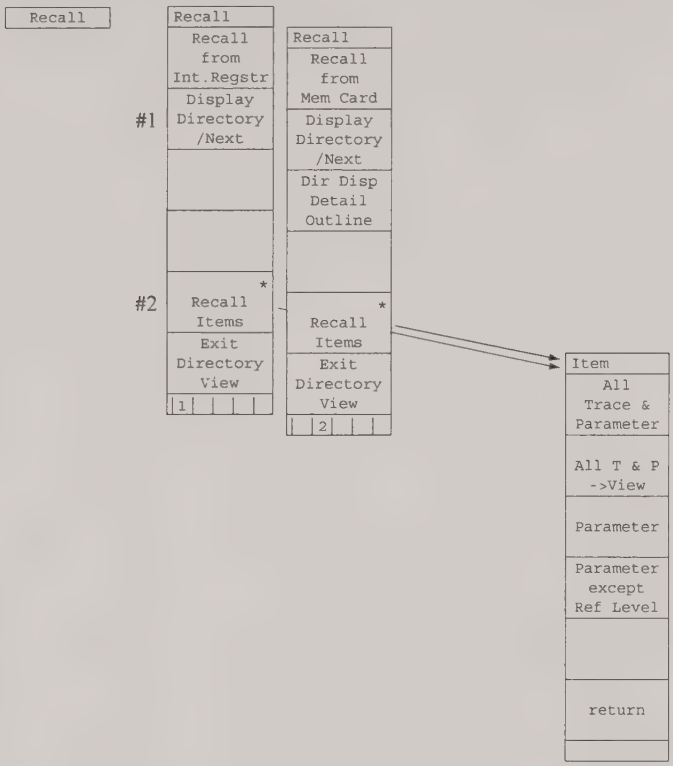
Menu Tree (10/21)



Menu Tree (11/21)



Menu Tree (12/21)



- Read out trace waveform/parameters from the internal memory or memory card.
  Select recall addresses and media/items, and display file directories.

  #1 Displays list of internal-memory directories.

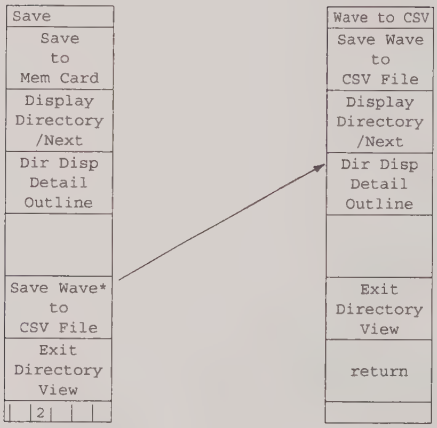
  #2 Specifies items to be recalled
  (trace waveform, parameter, etc.).

Menu Tree (13/21)

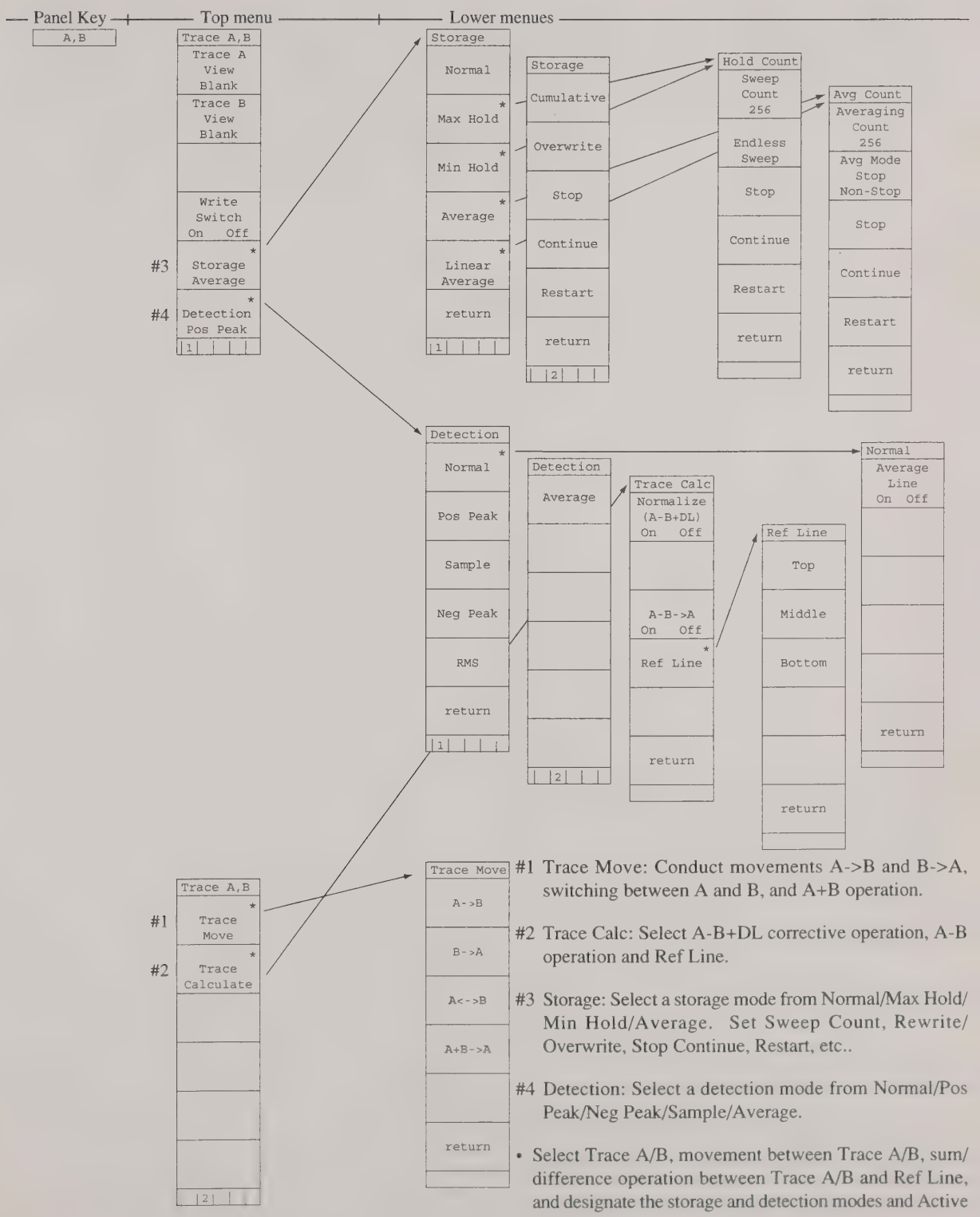
— Panel Key —+— Top menu —+— Lower menues —

Save
Recall

- Save trace waveform/parameters to the internal memory or memory card. Select saved media, and display file directories.



Menu Tree (14/21)



#1 Trace Move: Conduct movements A->B and B->A, switching between A and B, and A+B operation.

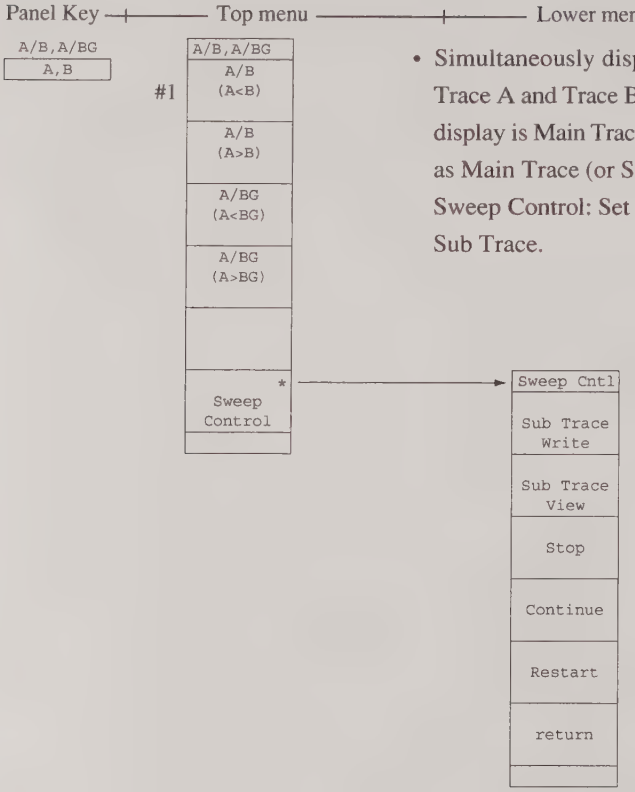
#2 Trace Calc: Select A-B+DL corrective operation, A-B operation and Ref Line.

#3 Storage: Select a storage mode from Normal/Max Hold/ Min Hold/Average. Set Sweep Count, Rewrite/ Overwrite, Stop Continue, Restart, etc..

#4 Detection: Select a detection mode from Normal/Pos Peak/Neg Peak/Sample/Average.

- Select Trace A/B, movement between Trace A/B, sum/ difference operation between Trace A/B and Ref Line, and designate the storage and detection modes and Active Trace.

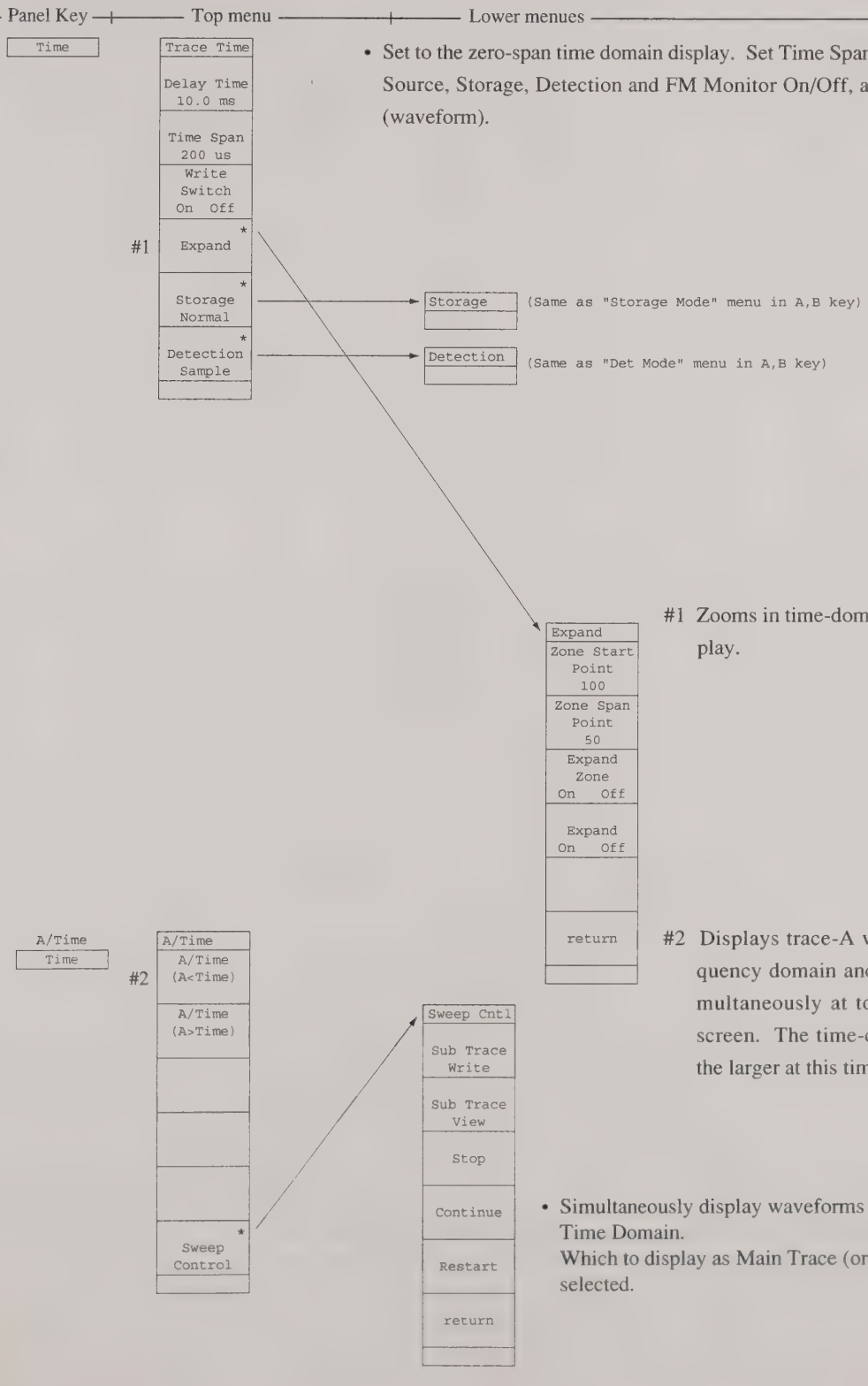
Menu Tree (15/21)



- Simultaneously display two waveforms, namely Trace A and Trace B or Trace A and Trace BG (peripheral spectrum containing Trace A). The large display is Main Trace and the small one is Sub Trace; select which to display as Main Trace (or Sub Trace).
  Sweep Control: Set Stop/Continuous/Restart for sweep and Stop/Write for Sub Trace.

#1 Displays two traces A and B simultaneously at top and bottom of screen. The trace-B display is the larger at this time.

Menu Tree (16/21)



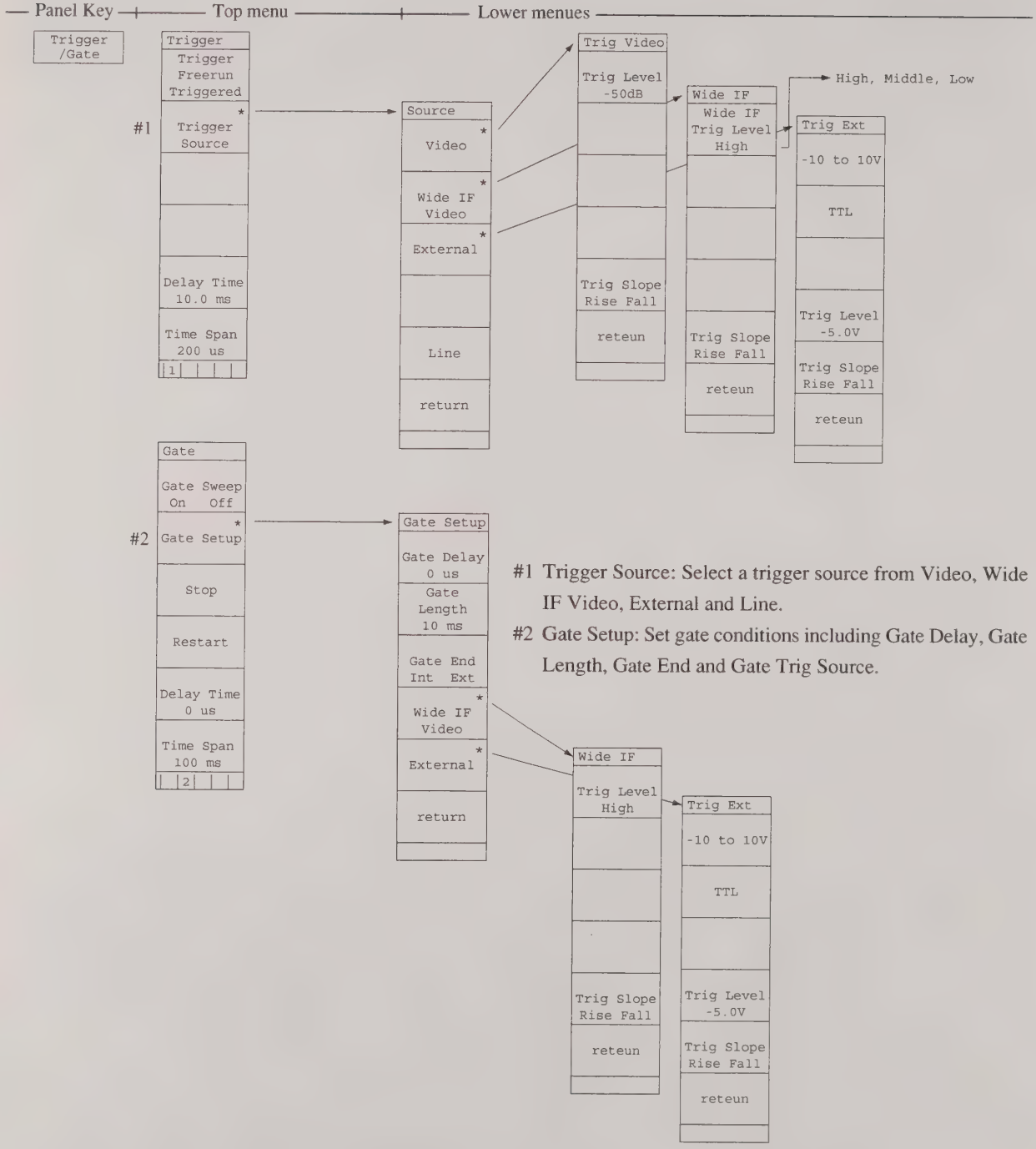
- Set to the zero-span time domain display. Set Time Span, Trigger, Trigger Source, Storage, Detection and FM Monitor On/Off, and select Expand (waveform).

#1 Zooms in time-domain waveform display.

#2 Displays trace-A waveforms in frequency domain and time domain simultaneously at top and bottom of screen. The time-domain display is the larger at this time.

- Simultaneously display waveforms of Trace a and Time Domain.
  Which to display as Main Trace (or Sub Trace) can be selected.

Menu Tree (17/21)



#1 Trigger Source: Select a trigger source from Video, Wide IF Video, External and Line.

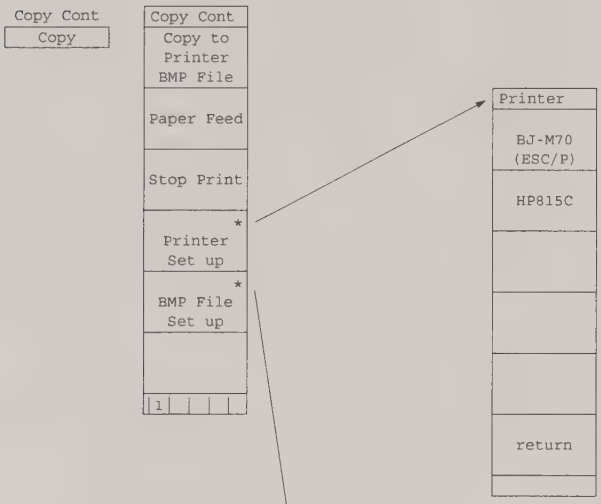
#2 Gate Setup: Set gate conditions including Gate Delay, Gate Length, Gate End and Gate Trig Source.

- Set gate functions for controlling the sweep start trigger and the writing of waveform data. Set the trigger mode, trigger source, trace time, delay time and time span. Select On/Off, Stop and Restart of Gate Sweep.

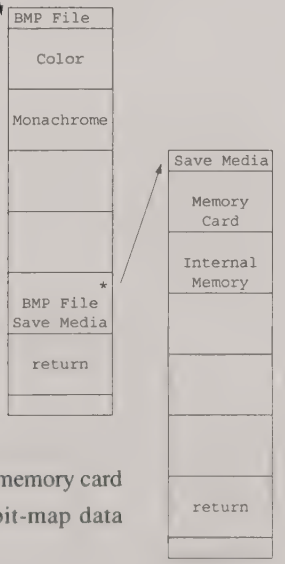
Menu Tree (18/21)

— Panel Key —+— Top menu —+— Lower menues —

Copy

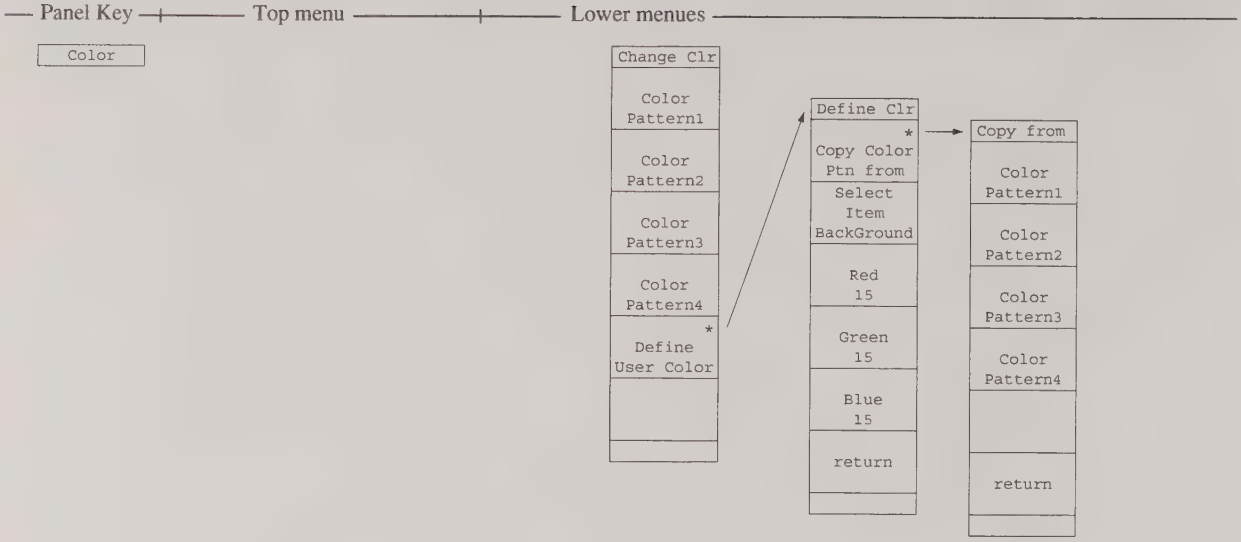


- Set Printer/memory card to hard-copy the screen. Set Printer/memory card, Printer (model)/memory card (model), Paper Feed, Stop Printer, etc..

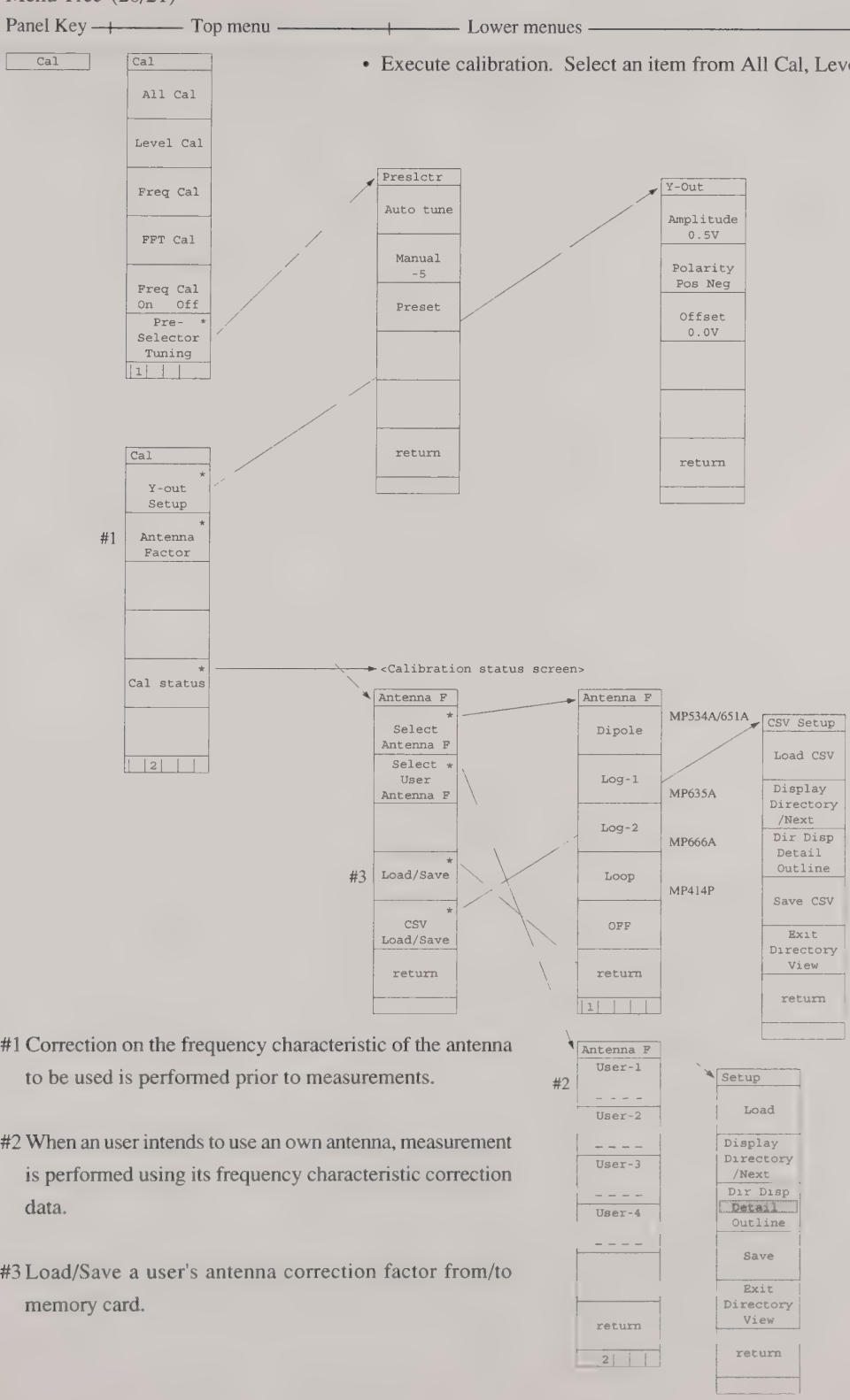


#1 Save the screen image data in memory card by BMP format (MS-DOS bit-map data format).

Menu Tree (19/21)



Menu Tree (20/21)



• Execute calibration. Select an item from All Cal, Level Cal, and Freq Cal.

#1 Correction on the frequency characteristic of the antenna to be used is performed prior to measurements.

#2 When an user intends to use an own antenna, measurement is performed using its frequency characteristic correction data.

#3 Load/Save a user's antenna correction factor from/to memory card.

Menu Tree (21/21)

Panel Key	Top menu	Lower menues
Preset	Preset	• Initialize measurement parameters. Select one from All, Sweep, Trace, Level and Freq/Time.
	Preset All	
	Preset Sweep controll	
	Preset Trace Parameters	
	Preset Level Parameters	
	Preset Freq/Time Parameters	
Hold		
Local		

Config mode Menu Tree

MS2681A/MS2683A/MS2687A Config Menu Tree (1 /2)

Panel Key — Top Menu — Lower Menu & Entry

Config

-Display-

[Comment]

- Title
- Clock
- Clock & Title
- Off

[Title]

[Date Format]

- YYYY/MM/DD
- MMM-DD-YYYY
- DD-MMM-YYYY

-Setting-

[Date]

- Year
- Month
- Date

[Time]

- Hour
- Minute
- Second

[RGB Output]

- On
- Off

[LCD Brightness]

- 1 to 5

[Buzzer]

- On
- Off

[Window Cursor Mode]

- Turn
- Stop

-Power On-

[Screen]

- Spectrum
- System
- Last

[Initial]

- Before Power Off
- Fixed State

1) Press Set key to select Top menu in Config menu after moving the cursor with knob or step key.
Press Set key to select Lower menu after moving the cursor.

MS2681A/MS2683A/MS2687A Config Menu Tree (2/2)

Panel Key — Top Menu — Lower Menu & Entry

-Copy Control-

[Copy To]

- Printer
- BMP File To Mem Card

[Printer Set up]

- BJ-M70 (ESC/P)
- HP815C (HP)

[BMP File Set up]

- Color
- Monochrome

Interface

-Interface-

[Connect To Controller]

- GPIB
- RS232C

-GPIB-

[My Address]

- 00 to 30

-RS232C-

[Band Rate]

- 1200 to 115200 bps

[Parity]

- Even
- Odd
- Off

[Data Bits]

- 7 bits
- 8 bits

[Stop Bit]

- 1 bit
- 1.5 bits
- 2 bits

[XON/XOFF Flow Control]

- On
- Off

File Operation

- Refresh Screen
- Sort
- Format
- Delete
- Write Protect
- Back Screen →

Appendix B Keywords Index

The following lists the main keywords used in this operation manual and the number of the pages on which they are used. Use it to search for the soft keys, function descriptions, etc.

[KEYWORDS INDEX]

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	*	1-6
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• Israel

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(DAEJEON OFFICE)
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(SERVICE CENTER)
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• Kuwait

TAREQ COMPANY
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• Malaysia

O'CONNOR'S ENGINEERING SDN BHD
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Selangor Darul Ehsan, Malaysia
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• Morroco

SEDEL
24, 26, Bd, Resistance, Casablanca, Morroco
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FAX: +212-2-449311

• Nepal

BR INTERNATIONAL PVT. LTD.
P. O. Box 60, Tamrakar Comm. Bldg., Bhotebahal Kathmandu, Nepal
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• New Zealand

NILSEN TECHNOLOGIES (AUCKLAND OFFICE)
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NILSEN TECHNOLOGIES (WELLINGTON OFFICE)
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• Pakistan

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FAX: +92-42-7221456

SUPERIOR ELECTRONICS ASSOCIATED
B-98 Block H, North Nasimabad, Karachi-33, Pakistan
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• Philippines

SALRITSU INTERNATIONAL TRADING CORPORATION
5QB ODC International Plaza Condominium, 219 Salcedo St., Legaspi Village, Makati City 1229, Philippines
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• Qatar

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• Saudi Arabia

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ELECTRONIC EQUIPMENT MARKETING CO.
P. O. Box 3750, Riyadh, 11481, Saudi Arabia
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• Singapore

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FAX: +65-6282-2533

• South Africa

ETECSA (PTY) LTD.
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• Sri Lanka

INFOTECHS LIMITED
441, Alwitigala Mawatha, Colombo, Sri Lanka
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• Taiwan

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• Thailand

JASMINE TELECOM SYSTEMS CO., LTD.
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• Turkey

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FAX: +90-216-4144762

TEST
Sehit Adem Yavuz Sokak No. 14/15 06640, Kizilay-Ankara, Turkey
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• United Arab Emirates

UTMOST ELECTRONICS TRADING L.L.C. (ABU DHABI BRANCH)
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• Vietnam

SYSTEM & TECHNOLOGIES VETNAM LTD.
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• Zimbabwe

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